12

Regional smallholder dairy development programs

This chapter presents an overview outlining the successes and failures of past regional development dairy programs for smallholder dairy farming in Asia. A five-step model program is then presented, highlighting all the elements of a successful farmer extension program.

With increasing demands for liquid and processed dairy products, virtually every country in tropical SE Asia has proactive programs to encourage and stimulate domestic production of raw milk on smallholder dairy (SHD) farms. To ensure success, such programs must be carefully planned and implemented. Unfortunately, this has not always been the case.

The public sector is very active in SHD development, and this can often discourage private sector investment. Furthermore, government direct investments in milk production and milk processing are often unprofitable. Public sectors should concentrate their efforts in dairy development by facilitating the business operating environment through policies and strategies via tailored institutions and technical support and also by promoting dairy trade and liquid milk consumption. This should encourage and facilitate private delivery of public services.

To produce milk competitively, smallholders need accessible and affordable complete packages of technical support services, such as animal health and AI services. The private sector must be fully engaged with both government and farmers in developing regional strategies and also national action plans. Regional

dairy development is best undertaken by what is known as a Public Private Partnership or PPP.

The last 20 years of dairy research, development and extension in many Western countries has produced quite 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, forage conservation and feeding stock, while cows grazing at pasture are able to harvest their own forages more efficiently than can farmers. Low population 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 many SHD farmers in most Asian countries. Being in the tropics, feed quality suffers from high temperatures, humidities and often 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. A good measure of heat stress, the Temperature Humidity Index (THI), 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 correctly 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 SHD farming in Asia 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 most dairy development initiatives. However, in terms of feed inputs per kg of milk produced or farm milk outputs, improvements have been slow. This is demonstrated by the inability of virtually all dairy industries in SE Asia to markedly improve their self-sufficiencies in milk over the last 10 years (see Table 1.1 in Chapter 1), hence reduce their reliance on imported dairy products.

In addition to the above biological constraints, the other major problem to achieving national dairy development production targets has unfortunately been a common human failing, namely an inability to properly plan for such initiatives, in the short as well as the long term. This chapter discusses this problem at three levels:

first, at a regional dairy program level; second, a 'greenfield' or new farm development level; and third, troubleshooting existing dairy farms that are not performing, even to expectations. Many regional dairy development projects also involve the construction of a series of medium to large-scale dairy farms (say from 200 to 1000 milking cows) frequently on a 'greenfield' site or one with little existing dairy infrastructure. The third level occurs all too often when poor planning has resulted in new or existing farms that do not achieve realistic production and profit targets.

The importance of long-term planning is paramount in any dairy development program. We often hear the comment 'Failing to plan is planning to fail'. Unfortunately, this applies to much of the dairy development around tropical SE Asia.

12.1 Steps in planning dairy development programs

12.1.1 Regional dairy programs

A common problem with many regional dairy development programs is the desire to introduce the stock long before the infrastructure has been fully prepared to support them. Importing pregnant dairy heifers provides a small window of opportunity for their eventual calving and milk production. However, all too often this window is too small to prepare for a heifer's change to a lactating cow, requiring optimum feeding and herd management to settle into their new, often more hostile, environment.

Figure 12.1 lists 10 steps that should be followed in any large-scale regional dairy development program while Figure 12.2 summarises the protocols involved. It is essential to organise markets, milk processors, physical and social infrastructure before introducing stock. The actual cost of milk production cannot be determined until the stock are on-site and their actual, rather than their predicted, levels of performance and required inputs can be quantified.

An additional step that overrides the success of all those in Figure 12.1 is a planned and ongoing supply of finances to ensure each step actually occurs 'on time and on budget'. This requires a long-term commitment from financiers well before the program starts. This budget must incorporate realistic levels of cow performance based on local information or estimates and not those from other often over-optimistic ones, generally derived from temperate, and hence less stressful, environments. The budget obviously needs to incorporate a cash flow as well as long-term loan repayments and should not plan for any profits for several years into the programmed development.

12.1.2 A 'greenfield' or new farm development site

Converting a greenfield site into a profitable and sustainable dairy farm also requires careful planning. The steps to take are similar to those in Figure 12.1

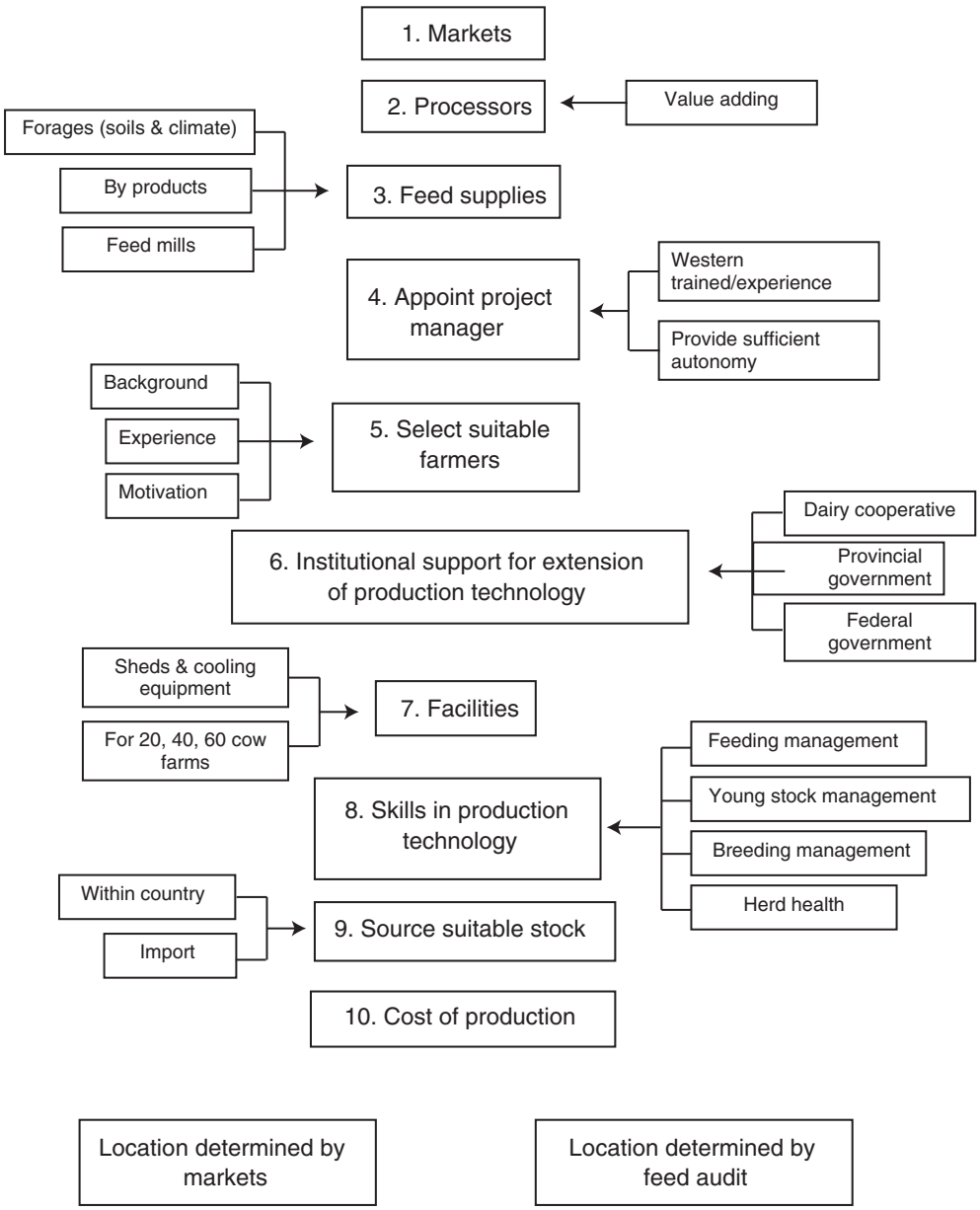

Figure 12.1: Ten steps to be followed in any regional dairy development program.

except that several of them would be taken for granted. For example, one would assume that there is an existing market and milk processors (Steps 1 and 2) or at least one that will definitely develop in time to utilise the raw milk from the new farm. Ensuring a sustainable feed supply (Step 3) and suitable staff (both managerial

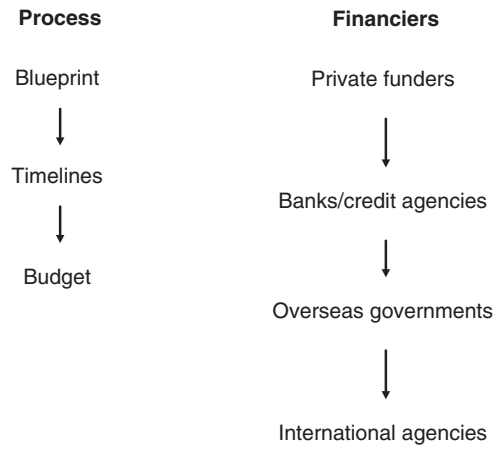

Figure 12.2: Summarising the protocol for regional dairy development.

and general farm staff, Steps 4 and 5) are essential before introducing the stock. The diversity of skills required by dairy farmers and their farm staff has previously been discussed in Chapter 6.

Step 6, the importance of training the farm staff, should be taken for granted as that would have been ascertained before the project started. The basic facilities must be constructed before the stock arrive. Of greatest importance, the assurance of sufficient and timely supply of finances is essential to ensure the project does not stall at any step along the way.

Probably the most important decision that needs to be made for a greenfield site is the proposed stocking capacity, that is the number of milking cow units to be maintained per ha of forage production area. One milking cow unit is one adult cow plus 20% of its replacement heifer, that is assuming a 20% replacement rate per annum. The farm should aim to supply as much of the annual forage requirements as possible, to give the farm management team more control over the supply and quality of such forages than if they have to be purchased off-farm. The hardest part of this decision process is the assumption of annual growth rates of such forages. This has been discussed in detail by Moran (2005), who has concluded that to ensure all forages can be grown on-farm, such target stocking capacities should range from 7 to 10 milking cow units per ha forage production area. Once this has been decided, then a more realistic calculation can be made of the total tonnages of forages that need to be purchased. The annual requirements for the other major dairy feed, namely concentrates (either formulated or sourced as raw ingredients), also need to be ascertained so that long-term sources can be assured early in the project.

Net cash flow means an estimate of farm expenses as well as farm income. The majority of cash is generated by the sale of milk. The shape of the lactation curve

(Moran 2005) means that this can only be consistent from month to month with careful planning to source dairy stock at several times during the early years of the project, and not all at once. All too often such greenfield projects fail altogether or require major cash flow revision because all the stock were introduced at the same time.

12.1.3 Hitting the 'white wall'

The above highlights a classic scenario where 'new' farmers enjoy a rapidly increasing cash flow when all cows calve down over a short time frame. The farmer often then increases his cash input, sometimes into lower priority investments, neglecting the most important ones, such as maintaining a high quality (hence high intake) ration as cows approach mid and late lactation and ensuring optimum reproductive performance (using additional fertile bulls rather than depending entirely on artificial insemination and ensuring all field staff develop skills in heat detection). Persistency of milk production (as quantified by the average monthly decline in milk yield from peak yield) is one of the often neglected, key measures of success of a feeding program and has been discussed in Chapter 8 in Section 8.7.5. It should be of the order of 8% or less per month decline from peak rather than the all too common 12% or more (Moran 2005).

Too often herd milk production rapidly decreases as cows move into the less productive phases of their lactation, reduced cash flows follow and the farm's net income declines to such an extent that its long-term viability may be at risk. Such scenarios are rarely made public as national pride can be at stake, hence it is often repeated by new, inexperienced investors in dairy development.

12.1.4 Troubleshooting an existing dairy farm

Troubleshooting the mismanagement of an existing enterprise can be one of the hardest problems because errors in design and construction of facilities, shortfalls in supplies of feeds, particularly forages, and inadequacies in managing the stock may have already introduced constraints on potential cow and farm performance. We will discuss this using a theoretical case study based on an actual situation.

A 150-milking cow free stall barn farm was established using pregnant grade Friesian heifers, all imported at the same time, in a hot humid environment in tropical SE Asia. Insufficient area was allocated to forage production and very few staff had had much experience with intensive tropical dairy farming. Within its first 5 months of operation, milking stock were suffering from severe weight loss, stock (cows and calves) were dying, milk yields fell to average only 7 kg/d, cows were not cycling post partum and there were increasing numbers of new cases of mastitis occurring every month.

Over the following 5 months the farm management, with consultant advice, were prepared to invest in a series of farm improvements that had dramatic beneficial effects on cow and farm performance. Milk yields and body condition increased and the cows started cycling. These farm improvements included:

- sourcing and developing more area for forage production
- ensuring year-round supplies of clean drinking water
- introducing a mixer wagon to allow for blending the ingredients and mechanical feed delivery
- concentrating on ration formulation to balance daily energy, protein and other nutrient requirements
- introducing a fermentable energy and a rumen degradable protein source
- incorporating a small amount of rice straw in the diet to provide physically effective fibre
- formulating lower cost rations to reduce feed costs
- improving newborn calf hygiene and colostrum feeding
- routinely Californian Mastitis Testing cows followed by antibiotic treatment of subclinical mastitis cases and culling chronically infested cows
- purchasing bulls for natural mating, rather than just planning to practise artificial insemination
- installing a water sprinkler system and cooling fans for better climate control
- introducing recording systems, using both notebooks and computer software, to more closely monitor daily management practices
- establishing a computer system to quantify milk income less feed costs and the proportion of feed consumed by non-productive stock each day
- selling off bull calves and cull stock
- initiating regular faecal and blood sampling and vaccination protocols for better disease management
- using pregnancy diagnosis and record keeping for better reproductive management
- importing pregnant stock with a range of expected calving dates
- improving on farm biosecurity.

Over a 12-week period, following these improved management practices:

- the number of cows dying decreased from five per week to zero
- feed intakes increased from 8.4 to 15.0 kg DM/cow/day
- average milk yields increased from less than 8 to more than 14 L/cow/day
- body condition scores improved from 1.5 to 3.5 units (out of 5)
- the farm manager signed the consultant up for a further period
- the owner was seen more often with a smile on his face.

12.1.5 Importing dairy stock from overseas

Very rarely, if at all, can dairy development programs rely on natural increases of heifers to populate the new regions. Calf mortalities are just too high in most SE Asian countries. For example, Moran (2011) reviewed the published data concluding that a range of 15 to 25% pre-weaning and early post-weaning mortality rates would be typical on many tropical dairy farms, in contrast to the 3 to 5%

(a)

(b)

Figure 12.3: Regional development programs often involves importing large numbers of dairy heifers for many small farms. Airfreighting them in is often more logical as this reduces travel stress. (a) Loading crates of heifers onto the freight plane in Sydney, Australia. (b) Each crate contains 7 to 9 heifers, depending on their age and pregnancy status.

considered normal on well-managed dairy farms in developed temperate countries. Such high mortality rates would also be indicative of large numbers of surviving

calves that have suffered permanent health problems leading to reduced lifetime performance. Therefore, the only way to source more dairy stock to improve farm and regional milk outputs, assuming they can be fed adequately, is through an active program of importation. Australia and New Zealand seem to be the countries of choice, although Thailand also has an active dairy heifer export market especially to Malaysia and Vietnam (see Figure 12.3).

When considering importations of dairy heifers, there are two major decisions to be made, namely what genotype is the most suitable and what age should they be on arrival. Unfortunately all too often, the first is considered a 'given' by many decision-makers who plan dairy development policies. That is, they must be 'black and white'! If the dairy region is in the highlands (say above 800 to 1000 m above sea level) and/or in a region without extremes in temperature and humidity, this is often the correct decision. However, there seems little point in requesting Friesian heifers out of dams that have produced 5000 L milk per lactation, because it is highly unlikely that the imported heifers or their progeny will be managed well enough to achieve such milk yields, particularly if they have been imported for smallholder farmers. In most cases, any dairy genotype imported from a developed country is likely to be of higher genetic merit than the typical milking cow in tropical Asia.

Koonawootrittriron (2016) reported that from a genetic analysis of Friesians bred within Thailand, purebred cows had higher full lactation milk yields compared to 50% crossbreds (5050 v 4500 L), but they also had 43-day longer calving intervals (471 v 428 days). Because of health and reproductive problems, he recommended that farmers needed to keep the breed composition of their cattle at ~90% Friesian or lower for Thailand's SHD farms.

Jerseys or their crosses should be seriously considered in tropical dairy systems when climate constraints are apparent and/or when feeding and herd management is very much sub optimum. They are smaller, hence have lower maintenance requirements, have better climatic tolerance (due both to lower milk yields and physical characteristics such as sweat gland density and skin colour) and often better reproductive performance. In areas where financial incentives encourage farmers to produce milk with higher solids content, Jerseys even outperform Friesians. Data from Bangladesh SHD farms, as reported by Moran and Doyle (2015) confirm these statements. There are other dairy breeds that seem to perform better than Friesians in the torrid tropics such as Brown Swiss, or synthetic breeds such as Australian Friesian Sahiwals or the Girolando (from Brazil), while the purebred Sahiwal (from Pakistan) justifies further consideration.

The other decision to make is whether to import pregnant heifers or yearling (virgin) heifers. Pregnant heifers are the most favoured because farmers get 'two for the price of one', assuming the foetus is a dairy genotype. In addition, as the heifer is pregnant (at least diagnosed as pregnant) she does not have to be mated

soon on arrival at her new home where there is no guarantee that she will easily conceive. However, with only a few months to adapt to her new environment, there is also no guarantee that the heifer will remain a long-term member of the milking herd once she calves down. All too often one hears stories of very high numbers (up to 30%) of imported heifers being culled and destined for slaughter after having had only one calf. The most likely reason is that their poor feeding management post-calving and their higher genetic propensity to utilise body reserves to produce milk, have combined to result in anoestrus for many, many months post-calving. Such animals have become very expensive dairy beef animals. In the long run, yearling heifers may be better economic propositions than pregnant heifers.

Lastly, and of equal importance when importing dairy stock into tropical Asia, are issues of animal health. All countries, both importing and exporting countries have disease management protocols. Such protocols must be strictly enforced and regularly reviewed, in case of new disease outbreaks in countries of origin. Foot and mouth diseases and brucellosis are the two most commonly talked about but there are others to consider. In one recent example, two diseases, namely bovine viral diarrhoea (BVD) and infectious bovine rhinotracheitis (IBR) were isolated in virtually every aborted foetus arising from one importation of pregnant heifers. These can have long-lasting adverse impacts on cow performance so require additional surveillance to ensure they do not enter the country with the consignment.

12.2 The overarching principles of regional SHD development

Dairy development is generally associated with technical changes to improve milk yield per cow. However, it should be noted that:

- The use of exotic cattle is a rapid and potentially sustainable path to higher productivity, even for small-scale resource-poor farmers and in warm, semi arid or humid climates. However, there have been many repeated failures of such schemes for obvious but often ignored reasons.
- National and local breeding strategies need to address the realities of climate and disease risk to increase the likelihood of successful crossbreeding programs.
- Fodder production and preservation technology should be an integral part of any dairy development program, particularly if it incorporates importation of stock of high genetic merit.
- The success or otherwise of intensive fodder production schemes is more likely to depend on availability of cheap labour, scarcity of land and good access to milk markets than it is on the agro-climatic setting. Where labour is scarce, intensive fodder cultivation practices and the feeding of crop residues to cattle are unlikely to be taken up unless mechanised. Promotion of such schemes should pay very close attention to labour opportunity costs.

12.2.1 Requisites for long-term sustainable dairy development

In summary, for regional dairy development to become sustainable, there must be:

- adequate infrastructure and marketing opportunities
- access to reliable markets for increased milk production
- promotion through government policy
- availability of credit for purchasing of livestock and planting pastures
- available productive and adapted forage species
- ready access to information
- farm management systems that ensure adequate feed throughput the year
- management of animal wastes
- disease control measures including biosecurity in newly acquired stock
- adequate hygiene for milk collection.

12.2.2 How do various smallholder producer models perform?

From their assessment of dairy development in nine different Asian dairy industries, Dugdill and Morgan (2008) summarised a series of 'lessons learnt'. These were as follows:

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

The key lessons for the private sector were then:

- 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 more easily move up the marketing chain.
- Milk quality, diversity of dairy products and attractive product branding and presentation are prerequisites for persuading modern urban consumers to switch from imports to locally produced milk.
- 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.

The key lessons applying across the entire dairy sector were then:

- Smallholders need accessible and affordable complete packages of technical support services (such as animal health and AI services) to produce milk competitively. Not surprisingly, the key technical constraints are lack of feed and fodder, dairy breeding stock and training. Technical knowhow and skills can be delivered through vocational and outreach training by industry institutions or SHD groups.
- Pro-poor social programs, including school milk programs, need to be carefully targeted and are usually sustainable only if linked to remunerative markets.
- 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. School milk programs help develop the milk drinking habit while promoting future demand, but should be based on locally produced rather than imported milk.

They concluded with the five overarching principles of SHD development:

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 impacts of such policies, programs and activities on the farmers depend on the local context and the people involved.
5. The private sector must be fully engaged with both government and farmers.

12.2.3 Ensuring a future for smallholder dairying

With growing political attention to narrowing current income disparities, there are many opportunities to use dairying as an instrument for development more successfully. 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 SHDs 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. Policymakers must always remember who the intended beneficiaries are and how their lives will be affected by any proposed interventions.
- **Avoid over-prescriptive 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 Natural Resource Management (NRM). It also requires mobilising political support, skills and resources. However, it is difficult for developing countries to strive for sustainability when so many of its population 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 that should be practised by every element of society, not just those who demonstrate such beliefs in closed communities as part of their everyday life.

Smallholder farming systems, though ecologically sustainable, are basically traditional ones 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 policymakers in 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 SHD farms have the potential to be technically, socially and ecologically sound, and they constitute the majority of milk production systems in tropical Asia, it is not only economical but even 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. This does not mean 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.

Unlike crop science, most dairy production and health research are 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 look 'at the big picture' to employ farming systems or a 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 right 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 beneficial 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 on any one SHD 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 the utmost interest in people, and not only money.

In summary, dairy farming would have to be one of the most sophisticated forms of livestock production in the world and regional development programs should only be undertaken after careful and logical planning and with expectations of a long-term investment before profits accrue. To be successful, such programs must involve sourcing, or at least seeking support from, personnel with proven tropical experience in both dairy farming practices and dairy farm business management. Much can be learnt from the litany of failed dairy development projects throughout tropical Asia so these mistakes will not be repeated, as unfortunately occurs all too often.

12.3 The Dairy Smallholder Innovative Program

The self-sufficiency of milk production of many SE Asian countries is very low and in several cases is actually decreasing (see Table 1.1 in Chapter 1). Individual farm productivity is limited by many constraints to increasing per cow milk yields both per lactation and per lifetime. These include:

- 10 kg/day milk, compared to a realistic 15 kg/cow/day
- 15 to 18 months calving intervals, instead of 12 to 15 months
- 30 to 33 months age at first calving, rather than 24 to 27 months
- high numbers of cows suffering from climatic stress, as is evident by their respiration rates exceeding 70 breaths per minute
- high levels of subclinical mastitis
- unacceptable levels of cow lameness
- high mortality rates in young stock, often with little diagnoses of the cause
- high wastage rates within milking herds due to poor feeding and herd management.

The Profitable Dairy System's (PDS) project team has developed a strategy to work closely with SHD farmers and their service providers throughout SE Asia through a new capacity building program, entitled the Dairy Smallholders Innovative Program (DSIP). Its major objective is to develop individual farmer skills primarily in dairy production technology to improve the productivity of their milking herds to stimulate their farm performance and profitability, hence long-term sustainability.

The DSIP incorporates five closely related strategies:

1. Crystallising the major farm activities into a series of '**Golden Rules**'.
2. Quantifying the beneficial impacts of adopting these Golden Rules using **Key Performance Indicators**.
3. Demonstrating them on a series of **model farms**, which is more likely to encourage farmers to adopt them than by other capacity building approaches such as classroom-type seminars.
4. Disseminating the benefits of improved farm management practices to a large numbers of SHD farmers through a series of structured **discussion groups**.
5. Providing each participating farmer with the opportunity to more closely monitor his/her own farm productivity and economic performance using a **Farm Business Management** approach.

Many of the SHD industries in SE Asia have been hampered by the low relative performance (milk production and herd fertility) of their dairy stock, particularly in recent years. Much of this is due to the poor management skills of the farmers to improve their levels of dairy production technology. The DSIP has been specifically developed to provide these farmers with an adult learning program based on:

- a series of simple 'take home' messages (namely the Golden Rules)
- feedback mechanisms to assess their comprehension (namely Key Performance Indicators)
- 'hands-on' experiences via practical workshops and demonstrations on model farms
- firsthand validation in collaboration with objective measures of changes in farm business performance (via the model farms)
- facilitated sharing of knowledge (within farmer discussion groups)
- an opportunity to assess on-farm changes (improvements) in farm profitability and sustainability through individual monitoring of their own farm business performance.

12.3.1 The Golden Rules

These together with the associated program on Producing Quality Forages, have been outlined in Section 7.3 of Chapter 7.

12.3.2 Key Performance Indicators

These are essential to quantify the initial farmer performance, then to provide realistic targets for the life of the Program. These have also been outlined in Sections 7.4 and 7.6 of Chapter 7.

12.3.3 Model farms

There is a close relationship between animal welfare, cow performance and farm profitability on SHD farms. Similarly, there is a general lack of awareness of this

association by poorly resourced tropical farmers. Farmer-orientated capacity building programs are then a high priority.

Changes in a single farm practice can have a diversity of outcomes. Researchers use traditional approaches to scientific logic in a research environment, to try and hold all other variables constant when assessing the direct impact of one particular variable. However, 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 ideally needs to be undertaken on-farm.

The 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 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 which unlike other strategies, 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.

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.

Model farms 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 milk-collection centres, 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 among the private sector which could then be levered to provide additional resources for its operation.

The project team will need to select model farmers based on their credibility in the local dairy industry, their motivation to want to improve their farm practices and to share their knowledge. One motivation for an already efficient farmer to become a model farmer would be the offer of a full business analysis of his dairy operation to help him make more meaningful decisions for future development. There are many low investment modifications to existing farm management that can be demonstrated on a model farm. In fact, Moran *et al*. (2016) have categorised beneficial changes in traditional SHD farm management, noting that many of these only require improving the time management rather than actually having to invest actual finances. In other words, many changes in management practices have negligible costs apart from spending more time on any one task.

The modus operandi of model farms

The diversity of dairy production systems means that there should be more than one type of model farm. They could vary in herd size, housing and milking parlour facilities and source of feed supplies. A series of model farms should be developed, so farmers could see firsthand how improved farm management provides long-term benefits to their SHD industry. 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:

- These farms should be located in a dairying region, close to other commercial dairy enterprises.
- They should be of a commercial size and relevance to local dairy farmers within the next 5 to 10 years, for example, they could be between 20 and 40 milking cows (and associated young stock). If they are too large, farmers will have difficulty relating to them, hence not willing to adopt 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 other dairy farmers.
- They could be stocked with both locally sourced and imported dairy heifers as these will become the future benchmark of the industry.

- They should be managed by experienced dairy farmers with proven track records of innovative dairy farming.
- The day-to-day management would be the responsibility of the owner/manager but he will be guided by an advisory group of experienced dairy specialists, representing a range of agencies, from the investors, to expatriate dairy advisers to government advisers. This group will meet several times each year to monitor progress in each farm's economic performance as well as their role as extension tools.
- They would be operated as commercial businesses with additional resources available to develop effective extension activities, such as regular visits from local dairy farmers and other dairy stakeholders.
- The milk produced would be sold through the normal 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.
- In addition to the initial finances to purchase (or rent) the land and construct the facilities, agribusiness and maybe even government or other dairy industry stakeholders could be invited to invest. These investors 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 would be collated and regularly summarised to form integral parts of the extension messages.
- There should be regular meetings (small groups of farmers visiting) and an annual regional forum to extend the correct farm management practices.

12.3.4 Farmer discussion groups

As already discussed, farmers are motivated to improve their management practices more by seeing than by reading or attending training programs. They are also not good at keeping records unless they are sufficiently motivated.

Already successful in most developed dairy industries, for some reason discussion groups have rarely been utilised in tropical Asia. Granted there has to be a set of ground rules for any successful discussion group, but these should not be too onerous for the concept to be more fully accepted in Asia.

Farmers generally like gathering together to share ideas:

- This is even better if they can visit a farm and see how the management is and learn from what the farmer does well.
- The model farm is an ideal venue for such a visit.
- Groups can encourage innovation and new ideas as people are more creative in groups.
- Groups allow ideas to be more effectively communicated and applied.
- Groups can enhance networking and learning through pooling of skills and knowledge from individuals.

- Such groups must have strong aims or direction and clear objectives and aims must meet people's needs.
- These objectives need to be regularly assessed to see if they still meet people's needs and expectations.
- The group should collectively plan the program for the next few months.

One good way of getting farmers to express what they want to gain from being part of a discussion group would be to undertake a 'brainstorming' session to answer the following questions:

- What farm management issues are of most concern to the group? Develop a list of say five to eight of them.
- How should the group tackle each issue in the next 3 to 6 to 12 months? The group should then set achievable goals.
- What are the group's short and long-term priorities and how shall they set realistic and achievable goals?

The group needs a strong facilitator. This can be a farmer or a service provider who keeps all members regularly informed about future plans. Early meetings should have a sense of purpose. If nothing else, members should leave with a sense of achievement and a feeling that the group is moving towards worthwhile goals.

The facilitator should:

- gain the trust and confidence of the group members
- help the model farmer collect, analyse and interpret the farm data to be discussed
- ensure the model farmer is fully prepared for each group meeting
- facilitate the meeting, encouraging all farmers to contribute their ideas
- keep the group on target to discuss the key topic for the day
- seek resource people to stimulate further discussions
- summarise the day's discussion and major conclusions
- ensure the group sets the agenda for the next meeting.

Success of a group depends on several things, but includes:

- appropriate group size for purpose
- clear focus, aim or objective
- revisiting goals of the group often and measuring progress
- developing clear boundaries and ground rules
- developing clear expectations, roles and responsibilities
- ensuring participants have a degree of enthusiasm/willingness
- ensuring enjoyable social activities for a job well done
- having good interpersonal relationships
- ensuring individual's needs are met

- ensuring relevance of the chosen issue or topic
- ensuring resources are available (participants' fees or group funding)
- ensuring there is a skilled facilitator and also support staff
- providing skills training is appropriate for participants' role in the group
- respecting other people's views and opinions.

In summary, discussion groups are most successful if:

- They are well organised and have a planned approach.
- They have well-planned activities with a clear sense of purpose.
- There is strong 'ownership' of the group's direction by the farmer members.
- Groups are effectively facilitated.
- Information and planning is driven by regular evaluation of the group and its achievements.
- The facilitator and host farmer have a good idea of the key drivers to success of the business and knowledge of potential barriers to success.
- The host farmer is always comfortable with what is being presented to the group.
- The session concludes with a summary of the discussion and any opinions or thoughts that have been raised, to allow the group to clarify points of discussion and see that the discussion is targeted towards improvement.
- The group members can develop a good insight into what the model farmer is doing particularly well, so they can take home potential 'successes' to apply to their own farm business.

12.3.5 Monitoring business performance on participating farms

It is possible to quantify the cash flow, cost of milk production and business performance on any SHD farm quite easily by asking a series of specific targeted questions. Such an exercise on each DSIP participating farm will provide individual baseline data from which to predict the likely financial benefits in achieving target KPIs. More importantly, it will also provide comparative data on the changes in farm performance of model farmers.

Assessing farm business performance is the topic of Chapter 11 with a questionnaire presented in Appendix 3.