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Introduction

This chapter presents an introduction to the material available in each chapter of the book as a guide to the reader on how to gain the most from the material presented.

1.1 Milk supplies and demands in tropical Asian countries

Globally, agriculture provides a livelihood for more people than any other industry (primary or secondary) while dairy farming is one of the major agricultural activities. The FAO has estimated world milk production in 2012 at 754 billion litres. Hemme and Otto (2010) estimated that 12 to 14% of the world's population (or a total of 750 to 900 million people) live on dairy farms or are within dairy farming households. Livestock provide over half the value of global agricultural output and one-third in developing countries. Milk is nature's most complete food and dairy farming represents one of the fastest returns for livestock keepers in the developing world.

The Asia–Pacific region has seen the world's highest growth in demand for milk and dairy products over the last 30 years. Even though Asia has increased its milk outputs (as a percentage of global production) from 15% in 1981 to 37% in 2011, it still accounts for over 40% of the world's total dairy imports. The consumption of milk and dairy products in Asia has doubled over the last 30 years, now contributing to more than 60% of the total increases in global consumption.

Many of these countries now have school milk programs to encourage young children to drink more and so improve their health through increased consumption

of milk's energy, protein and minerals (particularly calcium and phosphorus). In future years, as these children grow and have their own families, milk consumption will increase at an even faster rate. According to Delgado *et al.* (2003), per capita milk consumption in South East (SE) Asia is expected to nearly double from 10 to 12 kg/head/yr in 2003 reaching 19 to 20 kg/head/yr by the year 2020. This 3% per annum growth will lead to a total milk consumption of 12 million tonnes/yr by 2020, which Delgado *et al.* (2003) predict will require 9 million tonnes of milk/yr net imports just to satisfy this demand. This is up from the 4.7 million tonnes of milk/yr imported in 2000. In summary, by 2020, SE Asia will then only be producing 25% of its total milk requirements.

Such growing demands have arisen by a combination of:

- increasing per capita incomes
- the emergence of affluent middle-class people in many low to middle income countries
- trends which increase the demand for protein foods and value-added dairy products
- increasing urbanisation
- expansion of modern retail outlets (with refrigeration cabinets) throughout Asia.

In other words, higher incomes and increasing urbanisation have combined with economic reforms and market liberalisation policies to heighten the milk import dependency of many countries in this region. Asia has then become increasingly dependent on the highly competitive, but ever increasingly volatile, global dairy commodity markets. Consequently, many Asian countries are striving towards self-sufficiency in dairy production, at least in drinking milk.

Most Asian countries still do and will rely heavily on imported dairy products for many years to come, even though many have active government policies to increase domestic milk production. There is a group of Asian countries with low per capita milk consumption and low self-sufficiencies and these countries are likely to be the ones with most proactive dairy development programs. These include Philippines, Indonesia, Thailand, Malaysia, Vietnam, Cambodia and Laos.

Dairy farmers can produce milk from six different types of ruminant, large ruminants (cattle and buffalo, plus camels in Africa and yaks in Asia) and small ruminants (goats and sheep). Small ruminants are rarely milked in Asia. Of the two buffalo ecotypes, river buffalo are the traditional dairy stock, with swamp buffalo rarely being milked. The majority of milk in Asia is then derived from cattle, with some buffalo milk produced in Myanmar, Vietnam, Philippines and Thailand while the large buffalo-milk-producing countries are India, Pakistan, China and Nepal.

While production has slowly responded to this growing demand, it has fallen short of consumption gains, leading to threefold increases in imports of milk and

dairy products. Of extra relevance to this increase in demand, this region is home to two-thirds of the world's poor and undernourished people who will greatly increase their demands for dairy products in future years, for the above reasons. In the developing countries, over 80% of the annual global 240 billion litres of milk are supplied by smallholder dairy (SHD) farmers with only 1 to 5 milking cows.

Table 1.1 presents FAOSTAT (2013) data from 15 countries in South and East Asia on their per capita dairy consumption in 2009, their annual milk production in 2012 together with their changes in milk self-sufficiency over the last 10 years or so. With regard to changes in self-sufficiency of milk and dairy products, several countries have achieved close to 100% self-sufficiency, while others have been unable even to maintain previous levels of self-sufficiency because demand has greatly exceeded supply. Others have minimum levels that have hardly changed over the last 10 years.

Table 1.1. The size and self-sufficiency of selected Asian dairy industries in 2012.

	Total dairy consumption (kg/capita/yr) [2009 data]	Total milk production (million tonne) [2012 data]	Self-sufficiency in milk (%)			
			2000	2005	2009	2011
South Asia						
Bangladesh	20.2	3.5	74.7	66.7	70.5	87.5
India	72.2	124.8	100	100	100	100
Nepal	43.0	1.7	99.1	98.6	98.0	100
Pakistan	171.9	37.9	99.5	99.8	99.8	99.4
Sri Lanka	35.9	0.3	32.9	24.7	33.8	27.0
East Asia						
China	30.0	42.4	87.0	91.8	95.1	87.2
Japan	76.5	7.6	79.8	80.4	81.2	83.5
Mongolia	150.5	0.3	99.2	96.4	96.7	99.3
S. Korea	22.9	1.9	90.7	86.1	82.2	74.7
SE Asia						
Indonesia	11.5	1.4	37.6	31.9	30.0	39.6
Malaysia	36.7	0.1	3.3	3.5	6.1	6.8
Myanmar	29.0	1.6	83.0	85.6	92.2	94.4
Philippines	13.3	0.02	0.7	0.8	1.1	0.7
Thailand	21.9	1.1	28.8	45.5	50.3	51.4
Vietnam	11.5	0.4	19.5	19.6	30.6	32.6

1.2 An outline of this book

This manual covers a wide range of topics primarily related to achieving the sustainability of dairy production systems in tropical developing countries. This book

is written for all the stakeholders in SHD production systems in the tropics (in Asia, Africa and Central America), but with an emphasis on the SE Asian countries (see Figures 1.1 and 1.2). In addition, unlike John Moran's previous books on tropical dairy farming, it provides guidelines for the best management practices (BMP) of large-scale, more intensive dairy production systems. While smallholders are the major suppliers of milk in the tropics, numerous larger farms are becoming established throughout the tropics to satisfy the increasing demands for fresh milk. It is hoped that both types of farmers and their advisers will gain much from this manual and improve the welfare, milk quality and productivity of their dairy herds. Policymakers and senior management should also benefit from reading selected chapters. In addition to photographs from Asia, this book includes several photographs from another tropical dairy industry, namely Kenya in East Africa.

Most tropical countries have proactive programs to increase local supplies of milk, which require increasing numbers of well-trained workers to service their dairy industries. Consequently, educators from agricultural schools, universities and technical colleges need to keep abreast of the latest technical developments and applications in dairy farming. This book also aims to serve this purpose.

The key target audiences for this book are:

- Farmers and stockpeople who want to improve the productive performance of their dairy herds.
- Farm advisers who can assist farmers to achieve this aim.
- Educators, usually at a technical level, who develop training programs for farmers.
- Educators, usually at a university level, who train dairy advisers in the basics of dairy production technology.
- Other stakeholders in tropical dairy production, such as local agribusiness, policymakers and research scientists.

These chapters are written so that they can be understood by advisers and tertiary students. As the trainers must ensure that other target audiences can comprehend their course material, they should select the most relevant sections to incorporate into basic programs for farmers. Each chapter has been written as a 'stand-alone' document, that can be individually downloaded from the internet. For this reason, there may be some degree of repetition between chapters but this has been kept to a minimum.

Every profession has its jargon, or words developed specifically for that profession, and agriculture is no exception. There are some very specific terms and acronyms that are routinely used by dairy researchers and advisers. These are explained in the Glossary and when they are first mentioned in this manual. Full publication details of all sources of information are presented in the References and further reading section, while the Appendices include several specific topics that

(a)



(b)



Figure 1.1: Two extreme systems for producing raw milk in the tropics. (a) Smallholder Kenyan dairy farmers delivering their morning milk to the local dairy cooperative collection truck near Nairobi. Each farmer averages 2 milking cows and sells ~5 L milk/farm/day. (b) Imported Australian Friesian cows resting in their dirt yard next to their free stall shed in North Vietnam. These cows average 20 to 24 L milk/cow/day.



Figure 1.2: Dairy farmers in Malaysia developing their individual farm blueprints during a Farm Business Management workshop.

can be easily accessed. For ease of finding specific information, the Index lists all the key topics covered in the book and their relevant page numbers.

It is nigh on impossible to write a book about tropical dairy farming in which every fact is relevant to every reader. What is of most importance to the actual farmer may not be the most crucial fact for the educator of technical or university level students or the dairy adviser who chooses to read this book. Furthermore, tropical dairy smallholdings take many forms – ranging from very small farms with fewer than five milking cows that are all hand milked, to larger operations with say 30 milking cows that are milked using ‘bucket milkers’ – these could be all owned by the one farmer or constitute a colony farm with many farmers owning small herds. Although grazing the milking herd is a rare feature on most tropical farms, the larger ones with adequate land may be able to graze their cattle, especially their dry cows or yearling heifers. Herd dynamics in a grazing situation can be very different to those in the confines of a shed, particularly one based on tie stalls. In future years, farmers may expand and be able to incorporate a milking parlour with fixed in-line milking harvesting equipment. In fact most sustainable and profitable dairy farms grow in the medium to long term, so for today’s farmer with 10 cows or fewer who may become tomorrow’s farmer with 20 to 30 cows, their knowledge of and practices to optimise cow performance will need to be

regularly updated. This book, although not aiming to be ‘all things to all people’ has been written for a very diverse audience, so there will be technical aspects that are less relevant to some but more relevant to other readers.

It is quite likely that many SHD (and even large-scale) farmers would find this book too technical and difficult to comprehend. If English is not their mother tongue, and unless they were well educated and/or travelled, very few may fully understand the subtleties of the English language. Future translations may become available in the future if there is sufficient demand.

1.2.1 What is a blueprint?

The title of this book, *Blueprints for Tropical Dairy Farming*, may make people wonder what it is all about. We are using the term ‘blueprint’ because much of this book is made up of checklists for many of the farm activities essential for the ‘best management practices’ (BMP) of tropical dairy farming. The senior author has previously written five books on tropical dairy farming (see the references at the end of the book) which detail much of the background and explanations of many of these BMPs. Rather than repeat the theory behind these BMPs, the reader is directed towards the relevant chapters in the previous books which are listed below.

1.2.2 The chapters of this book

The outlines of each chapter are as follows:

- Chapter 2 describes the diversity of dairy production systems in tropical Asia, and also provides a comparison of the pros and cons (that is, the arguments in favour of and against) of smallholder versus large-scale intensive dairy farming.
- Chapter 3 discusses the major benefits of intensification of smallholder dairy farming in the tropics followed by their key constraints with various approaches to their solutions.
- Chapters 4 and 5 present recommendations when considering the physical aspects (such as farm layout, shed design and farm infrastructure): first, of smallholder and second, of large-scale dairy farms.
- Chapter 6 discusses the selection and management of the human resources (farmer and farm staff) on both smallholder and large-scale dairy farms.
- Chapters 7 and 8 discuss the recommended BMPs: first, on smallholder and second, on large-scale, intensively managed dairy farms. Chapter 7 also introduces the concepts of Golden Rules and Key Performance Indicators (KPI) to provide the basis of a comprehensive capacity building program for smallholder farmers.
- Chapter 9 discusses the importance of farmers developing their observation skills when first entering the cowshed.

- Chapter 10 provides an insight into the problems associated with poor stock welfare, a potentially major issue with housed dairy stock in the tropics.
- Chapter 11 introduces the concepts of farm business management to provide farmers with a structured approach when assessing their business performance. This is followed with a case study of profits achievable on a large-scale intensive dairy farm in Indonesia.
- Chapter 12 discusses regional development programs, mainly from a smallholder dairy industry perspective. This leads to a complete regional development package called the Dairy Smallholder Innovation Program (DSIP), which incorporates five closely related strategies, several of which have been outlined in previous Chapters.
- Chapter 13 (the final chapter) highlights some of the developments still required for tropical dairy farming: first, *to become* and second, *to remain* more efficient and profitable. It also details how farmers can access through the internet a 16-module training program developed by FAO on feeding management of dairy cattle in tropical countries.

As many of the tropical Asian countries now have at least several large-scale dairy feedlots in their dairy supply chains, it would be remiss of us not to devote discussion to their BMPs, as well as successes and failures of such operations. In so doing, some topics in this book have been separated specifically into those relevant to smallholders and those relevant to large-scale dairy farms, for example Chapters 4 and 5 and Chapters 7 and 8.

Many of the chapters introduce new information, therefore it is important to include the background and other technical information to justify their recommendation as part of these blueprints. For example, during the 10 years since the publication of *Tropical dairy farming* (Moran 2005), there has been increasing emphasis on incorporating large-scale dairy farms into the domestic milk production systems of virtually every Asian country. Table 1.1 highlights the fact that in many Asian countries, dairy self-sufficiency has decreased (for example in Sri Lanka, Indonesia and South Korea) or has remained very low (in Philippines and Malaysia). Probably the two best ‘success stories’ regarding improving dairy self-sufficiency would be Thailand and Vietnam. In both these countries, large-scale dairy feedlots are proving successful in increasing local milk supplies.

1.2.3 Sourcing additional background and technical information on various blueprints in these chapters

In addition to new recommendations on improving the management of dairy farms, both large and small, this manual comprises many checklists based on background and technical information previously published in John Moran’s previous books on tropical dairy farming.

The number of internet hits on John's books as of August 2016 were as follows:

- A) 2005; *Tropical Dairy Farming: Feeding Management for Smallholder Dairy Farmers in the Humid Tropics* (68 301 hits).
- B) 2009; *Business Management for Tropical Dairy Farmers* (124 936 hits).
- C) 2012; *Managing High Grade Dairy Cows in the Tropics* (28 394 hits).
- D) 2012; *Rearing Young Stock on Tropical Dairy Farms in Asia* (101 023 hits).
- E) 2015; *Cow Talk: Understanding Dairy Cow Behaviour to Improve Their Welfare on Asian Farms* (21 850 hits).

All chapters of these books are freely downloadable from www.publish.csiro.au.

To assist readers in sourcing more background and technical information on the blueprints discussed in this book, the authors considered it beneficial to list the chapters in this book followed by the relevant chapters in the senior author's previous five tropical dairy farming manuals. As shown below, each chapter in this book is accompanied by a book code referring to the relevant chapter(s) in the previous books (e.g. A3 being *Tropical Dairy Farming*, Chapter 3).

- 1. Introduction; B3, E1.
- 2. The diversity of dairy farming systems in tropical Asia; A2.
- 3. Addressing the key constraints to tropical dairy farming; B2, E11.
- 4. Physical features on smallholder farms; A8, A20, C13, E7.
- 5. Physical features on large-scale farms; nil.
- 6. Managing the human resources of tropical dairy farming, nil.
- 7. Best management practices on smallholder dairy farms; C3, C18, D16, E5, E6.
- 8. Best management practices on large-scale dairy farms; A15, A16, A19, B14, C4, C6, C7, C8, D1.
- 9. Developing your observation skills; E5.
- 10. Addressing the problems of stock welfare; C11, E1, E2, E5, E9.
- 11. Introducing the concepts of farm business management; A17, B9, B11, C16, D15.
- 12. Regional smallholder dairy development programs; A20, B19, E11.
- 13. The final word; A20, B16, B19, D16, E9.