Dairy Herd Health and Management

A guide for veterinarians and dairy professionals

By Jos Noordhuizen
Edited by Helen Warren

About the author

Jos Noordhuizen was born on April 9th, 1947 in the Netherlands. He got his DVM diploma from Utrecht Veterinary Faculty in January 1975, after which he was appointed for 3 years in the Clinic of Obstetrics & Gynaecology of that Faculty, where he practiced Herd Fertility Schemes on dairy farms. After having spent some time in private food animal practice, he went back to Utrecht where he got his PhD on the subject Herd Health & Production Management on Dairy Farms in 1984.

In 1988 he was appointed professor in animal husbandry at the Wageningen Agricultural University. Later In 1997 he was invited for the chair of professor in ruminant health at the Utrecht Faculty where he stayed until 2005. He was guest professor in veterinary schools in Gent (Belgium), Nantes (France) and Lyon (France).

He is currently adjoint professor at Charles Sturt University, School of Animal & Veterinary Science (Australia) and consultant at VACQA-international (Portugal).

He has supervised over 35 PhD projects, published over 300 papers in scientific and practice journals, edited 4 books on various veterinary and dairy farming topics, organized several international courses, was invited for giving seminars all over the world, and participated in joint development projects in Costa Rica, Thailand, Vietnam and Sweden.

Jos was member of the Dutch National Health Council, appointed by HM The Queen, member of the scientific committee for health and welfare of the European Commission in Brussels, founder and president of the Dutch Association for Veterinary Epidemiology & Economics, cofounder of the European College of Bovine Health Management, and member of several international associations and congress organisation committees. He currently lives with his wife in Normandy (France).

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About the Book
This publication takes a new approach to the subject of Dairy Herd Health and Management. The author's 35 plus years experience in the area has lead to the conceptualisation and collection of different topics to better support dairy herd health and management programmes.

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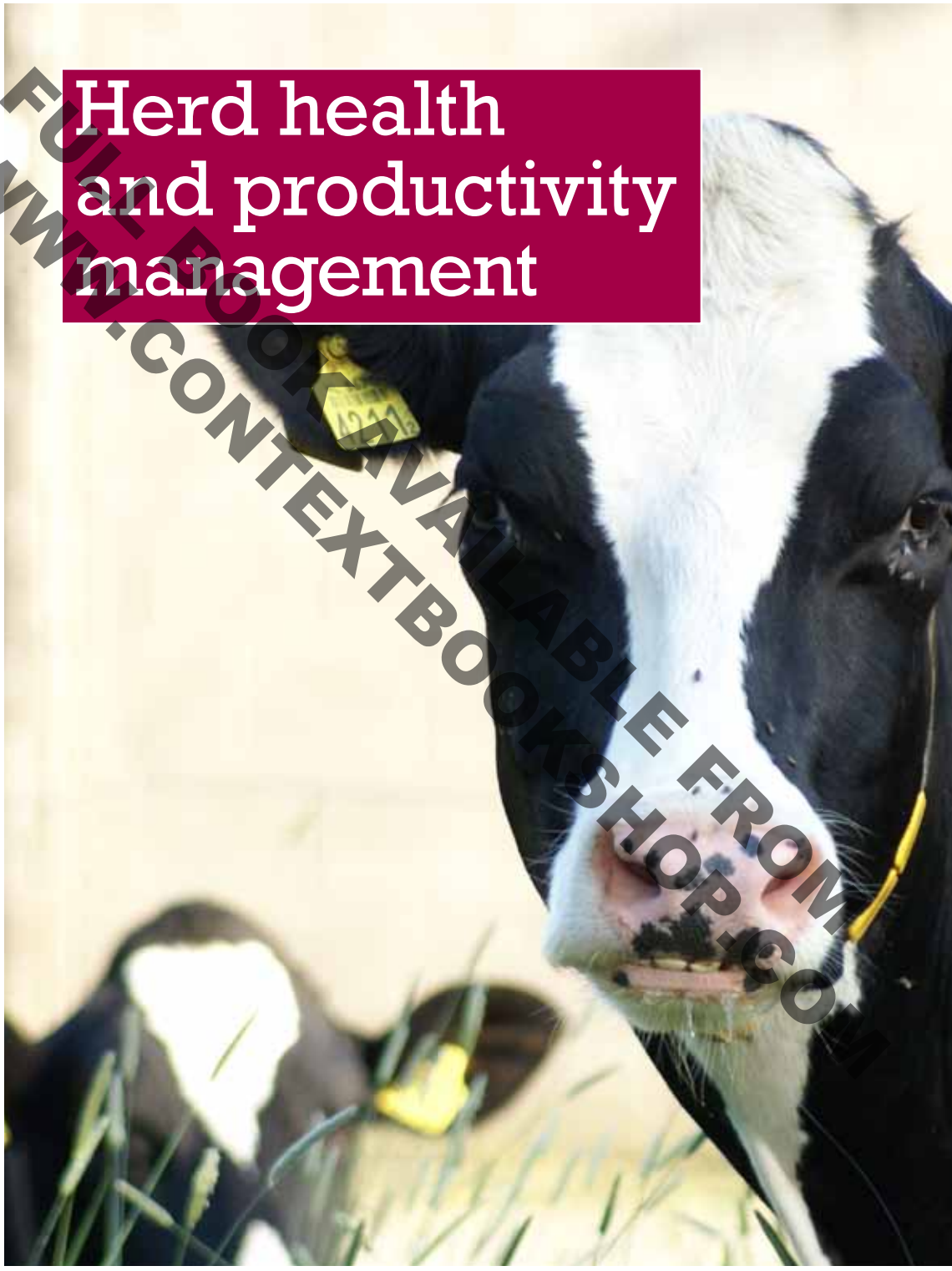
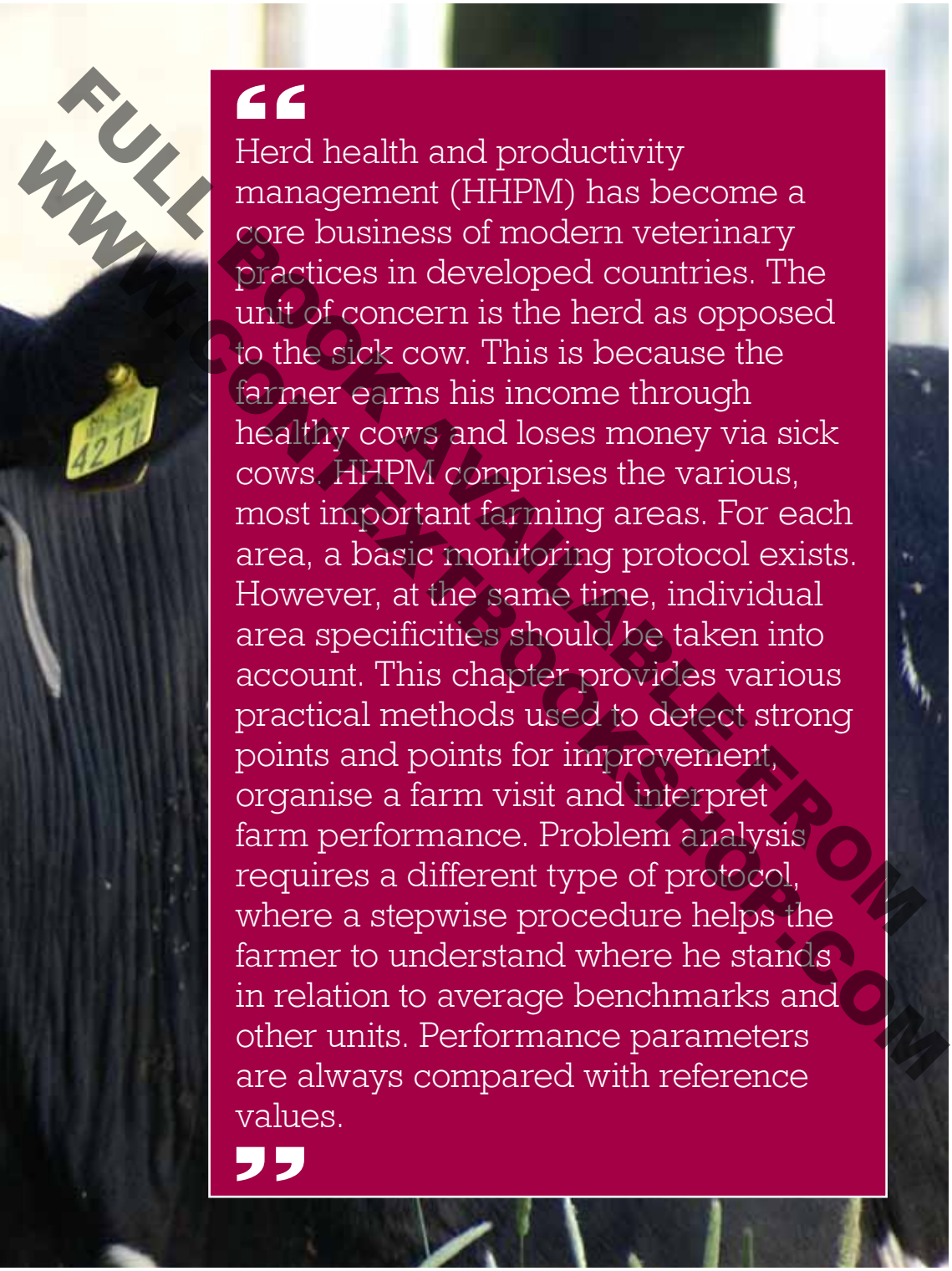
Sections

Herd health and productivity management





Herd health and productivity management (HHPM) has become a core business of modern veterinary practices in developed countries. The unit of concern is the herd as opposed to the sick cow. This is because the farmer earns his income through healthy cows and loses money via sick cows. HHPM comprises the various, most important farming areas. For each area, a basic monitoring protocol exists. However, at the same time, individual area specificities should be taken into account. This chapter provides various practical methods used to detect strong points and points for improvement, organise a farm visit and interpret farm performance. Problem analysis requires a different type of protocol, where a stepwise procedure helps the farmer to understand where he stands in relation to average benchmarks and other units. Performance parameters are always compared with reference values.

Transition period score sheet

Adapted from GD Deventer NL 2008

Table 1.3 General score sheet to assess the level of disease resistance in cows during the transition period

Farmer name	Name of veterinarian	Date of visit

		YES	NO
Nutrition	The average BCS of dry cows is > 3.5		
	A significant decrease in dry matter consumption by dry cows is observed		
Early lactation	Loss of >1 BCS point in the first 6 weeks after calving		
	Rumen Fill score after calving is < 3		
Minerals, Vitamins	Dry cows and/or heifers receive a total mixed ration (TMR)		
		SCORE	
Stress factors	Most calvings take place isolated and outside the herd (score 4)		
	Forage component at the end of the dry period or the day of calving differs by > 50% of the forage type in early lactation (e.g. low energy/ high fibre versus high energy + fibre)(score 2)		
	At the end of the dry period, the cow has not been adapted to at least 2 kg of concentrates (score 2)		
	The neonate calf is not separated from its dam within 6 hrs of birth (score 2)		
	There are too few cubicles for all cows in the herd (score 6)		
	There is not enough space at the feed table (score 4)		
	There are cow comfort problems on this dairy farm (score 4)		
	TOTAL		
		YES	NO
Herd health	Prevalence of infectious diseases is rather high (> 15% of cows in the herd are affected		
	Prevalence of other disorders (eg. mastitis, lameness, metabolic disorders) is rather high (> 15% of cows in the herd)		

If "**YES**" has been entered under one or more of the given situations above, this can be indicative of a reduction in disease resistance. In this case, a more in-depth analysis should be carried out to try to find the cause(s) of this reduction.

A score of **6 or higher under 'Stress factors'** indicates reduced **disease resistance**.

High prevalence of the diseases and disorders noted above can indicate a lowered disease resistance in the herd.

Biosecurity on farms

Biosecurity = a programme to reduce or prevent the introduction from external sources of infectious diseases, as well as the spread of such diseases once they have entered the farm.

Introduction

Infectious diseases can have a great impact on the economic performance of a farm and may also induce stress in the farmer. Examples of such diseases are: salmonellosis, BVD, IBR, brucellosis, tuberculosis, paratuberculosis (Johne's disease). As well as animal and farmer welfare, these diseases have wider implications for the overall standing and image of the dairy industry, including damage to public image, loss of market position and decreased slaughter value. Moreover, in the EU the farmers are held responsible for the products (milk, meat) they put on the market, including the safety of those products. Hence, they are held responsible for any sort contamination (microbiological; chemical etc).

The production process influences the health and welfare of the cattle in the herd, as well as public health. After all, the farmers represent the first link in the dairy food chain! The negative effects of infectious diseases can have implications for both the short- and long–term and depend on, for example, the type of disease/pathogen ,the level of commitment by farmers to address these diseases/pathogens and the concerns of consumers.

Given the important consequences of infectious diseases, the development and implementation of biosecurity programmes should be a high priority among farmers.

Vaccines and antibiotics have been the number 1 choice to prevent, control or reduce the incidence of infectious diseases. However, for certain diseases, they are unavailable or are not sufficiently effective; sometimes, if available, they are poorly administered. In other situations there is limited option for using vaccines (e.g. the EU).

For poorly administered vaccines, one can develop technical working instructions (a kind of 'best practice') including the correct procedure for administering medicinal drugs, as well as correct stock handling, dosage, withdrawal time, etc. Such working instructions must be strictly complied with. Even instructions for the correct use of antibiotics must be strictly adhered to in order to prevent contamination of milk or meat and to minimise resistance development and residues. It is important to remember that vaccines and antibiotics do not replace good biosecurity, even when required for reducing the prevalence of a certain disease (eg. BVD; IBR).

Components of a biosecurity programme

The components of a biosecurity programme are management instruments (Good Dairy Farming Code of Practice). Some of the areas of concern and relevance for veterinarians are listed in Table 2.1

How to design a biosecurity programme

There are five steps to take when designing a biosecurity programme for use on farm:

1. Conduct a written, critical inventory of infectious diseases that are relevant to the farm. Take into account the geography, soil type, housing, animals, people and visitors, transportation means.
2. With the farmer, identify the most important infectious diseases already present in the herd.
3. Identify the most important infectious diseases that are not yet present on the farm but present a threat.
4. Conduct a Diagnostic Herd Evaluation (animals, environment, data) to determine the level of risk for the transmission of selected disease pathogens. Formulate goals for the biosecurity programme : for example a 5% reduction in the prevailing clinical mastitis incidence per year; or, the elimination of IBR from the dairy herd in 3 years.
5. Illustrate the biosecurity programme and implement it. Work together with the other people working on/for the farm, including professional consultants to try to ensure compliance. The programme must be updated at least annually.

Areas of concern

Adapted after the text issued by AFIA – BAMN publications, Dorann Towery, 1501 Wilson Boulevard, Suite 1100, Arlington, Virginia 22209, USA (2001).

Table 2.1 Areas of concern & relevance to veterinarians involved in a dairy farm biosecurity programme

New additions	**Cattle, semen, embryos** Note that e.g. Neospora and BVD can be introduced by healthy animals. Moreover, healthy animals can introduce diseases with a long incubatuon period (paratuberculosis).	Check all animals. Test for relevant diseases. Sample milk for bacteriological testing. Vaccinate twice before transportation. Quarantine the animal for 3 weeks before mixing with the herd. Buy semen or embryos or sires from certified traders or with active disease control programmes
Forages and concentrates; water	**Concentrates** **Salmonella spp.** can be found in feedstuffs and in pasture. **Forages** **Salmonella spp.** can be found in forages irrigated with contaminated water. Incorrect harvest or feed stocking may introduce clostridium bacteria. **Water** Water sources can be contaminated and introduce **E. coli** or **Salmonella spp.**, as well as **Cryptosporidium parvum**.	Test water for bacteriological, chemical and nutritive contamination. Ask cattle and feed traders to show the quality assurance for their feeding programme, their stock and their delivery. Prevent faecal and urinary contamination of feedstuffs and water.
Contact between animals	Fences, shows and expositions, errant animals, putting sick animals in the barn, calving pen. Contact between groups of different ages.	Minimise contact between different animal groups. Consider cattle returning from shows or markets as new additions (see above). Minimise contact with non-resident cattle.
Wildlife and other vectors	**Squirrels, rats, mice, foxes** **Salmonella, Brucella, Leptospires.** **Insects** Anaplasmose, Blue Tongue **Rats, mice** **Salmonella, E.coli**	Prevent contact with wildlife. Use pesticides and traps close to feed. Exercise control measures for insects and birds, on and around animals.
Animal health management	**Procedures -**Comply to the Good Medicine Application Code of Practice Note that practices like de-horning, vaccination and implanting could cause disease transmission.	Use disposable utensils. Disinfect other utensils between use on different animals. Use vaccines according to prescription.
Noxae	**Vehicles, persons**	Wash trucks and vehicles after use. Dedicate a special site for dead cattle. Provide strict hygiene instructions for visitors.

Calf rearing

The rearing of young stock on a dairy farm can be considered as an individual business enterprise. This chapter addresses many issues of rearing. First attention is given to, particular events in specific rearing periods together with specific risks followed by checklists for evaluating rearing management quality. Also included are several protocols for IgG testing, checking calves for respiratory disease, diarrhoea and rehydration, as well as heart girth measurement, ration composition, housing of calves, proper dehorning, hygiene, BVD control, biosecurity and for estimating estimation of losses related to mortality.

Claw trimming

Functional (preventive) claw trimming

Trimming should never be carried out in the month prior to calving.

However, cows may be trimmed on the day of drying off and then again at two to three months after calving (when they are through the high risk period and will more easily recover from any claw lesions).

A second option is to trim all cows twice a year (or more if needed), taking care not forget groups of animals, such as the pregnant maiden heifers

With this option, ensure all cows are trimmed in one day or, at the most, over two consecutive days.

A third option would be to trim cows on an individual basis, for example, cows with highly sensitive claws.

Curative claw trimming

It is essential to trim claws of cows that show poor hind leg conformation, lameness or hoof deformities. Delaying trimming, in this situation, will exacerbate the situation and could result in problems with remaining claws, either by infection or by mechanical overload.

Claw trimming should only be carried out using the appropriate tools and facilities. There exist several simple claw trimming facility options:

- Mobile - these may be placed behind your car
- Installation in a cubicle
- Fully equipped, stand-alone devices that can be placed anywhere on farm.

The following gives an example of a list of animals selected for claw trimming, together with the reason for selection, as part of the routine Herd Diagnostic Evaluation during a farm visit:

Table 4.1 Example of cow selection for claw trimming

Cow ID	Reason for trimming
5671	front claw deformation
5670	hind claw too long
3145	front claw show some deformity
1352	all 4 feet too high and too long
8330	overgrowing soles
1806	lesion on hind claws?
8340	lesions on hind claws?
8329	all 4 feet too high and too long
5648	front claws too long
5693	front claws too long

This list indicates a lack of good claw management, demonstrating the need for routine claw trimming and inspection i.e. a functional (preventative) trimming plan.

Protocol No 1 for problem analysis of claw lesions

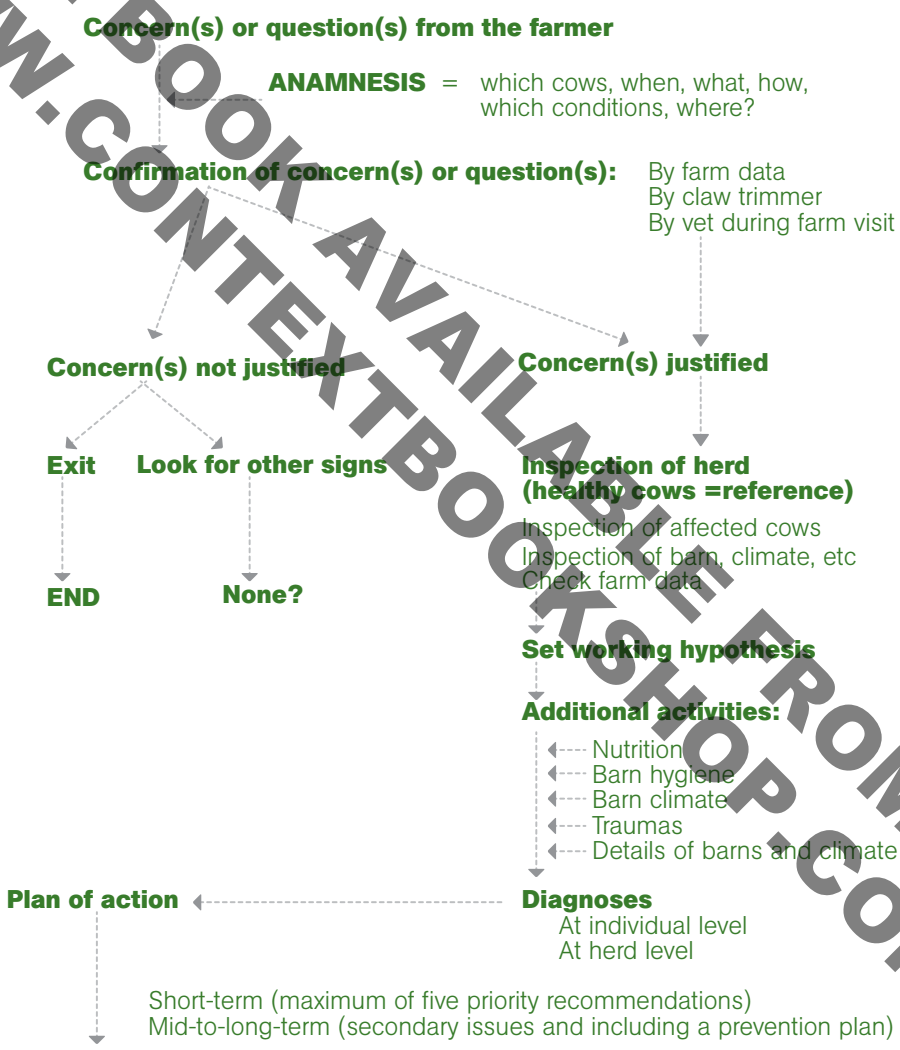


Figure 4.3 Protocol 1 for analyzing herd claw problems

Welfare - frequency of lameness

Eighty dairy farms, with either a loose housing system with straw yards or as tied stalls, were assessed for the prevalence of lameness. There was a large variation in lameness prevalence between the two systems.

Results

1. Farmers do not know the lameness risk factors very well
2. The rate of lameness detection is abnormally low, 8% observed versus 27 to 34% in reality
3. Treatments for lameness are either too late or non-existent
4. The fact that herd claw trimming is rarely executed makes the situation worse
5. The barn surfaces are not very well and there is a lack of cow comfort
6. The steps (cubicles; drinking places) are too high (> 20 cm is bad) and sometimes there are even two steps
7. There are traumatizing areas and or slippery areas in the houses
8. The exercise areas are muddy and or full of gravel
9. The lack of hygiene and the humidity provoke claw lesions
10. The traumas on a hard wearing floor, and gravel are prone to cause phlegmonas.

Primary criteria for cattle welfare

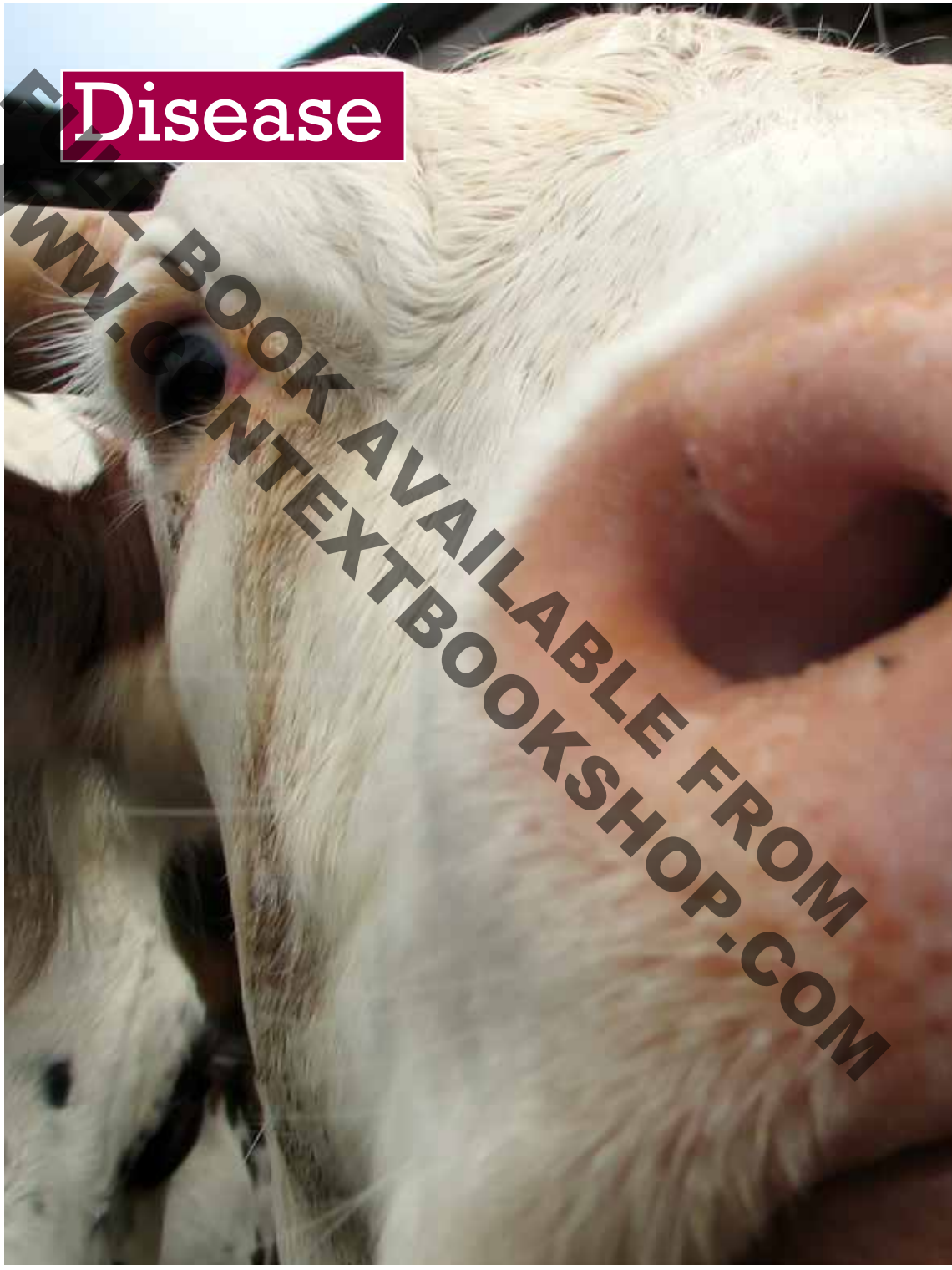
1. The body posture of the cows.
2. The straightness of the spine of the cow, both while standing and while walking (locomotion score).
3. Treatments for lameness are either too late or non-existent
4. Treatments for lameness are either too late or non-existent

To ensure cow welfare better, a herd claw trimming routine must be implemented. Trimming frequency should be every four months. An alternative option is claw trimming twice yearly. Older cows and repeat cases must be trimmed more frequently.(Note that the current Dutch method of claw trimming is to trim the claws twice per year (routine functional trimming) and to trim each cow just before drying off, as well as after peak milk yield (after 100 days lactation). If necessary, older cows and chronic cases must be claw trimmed more often.

Table 6.1 14 key animal needs for cattle welfare*

Feed*	Health*
Drinking water*	Reproduction
Respiration	Grooming*
Excretion	Locomotion*
Resting*	Orientation/ exploration
Safety*	Pain experiences
Thermoregulation	Social interactions*

*= 8 primary issues for assurance & control
Note: these Animal Needs include both positive and negative [risk] indicators.*Metz, 2003, after Dantzer 2002 & Bracke *et al.* 2002)



Disease

> “Cattle health can be further optimised by knowledge of diseases that affect cattle. Preventing disease has become more important than curing disease and one key element in prevention is disease risk identification and management. Examples are given in this chapter and, although some diseases are addressed through checklists, this publication is not designed to be textbook on diseases.”

Level of resistance

Adapted from
GD Deventer NL, 2008

Table 7.1 Rapid screening test for the level of resistance in cows during the transition period

FARM: **Veterinarian:** **DATE:**

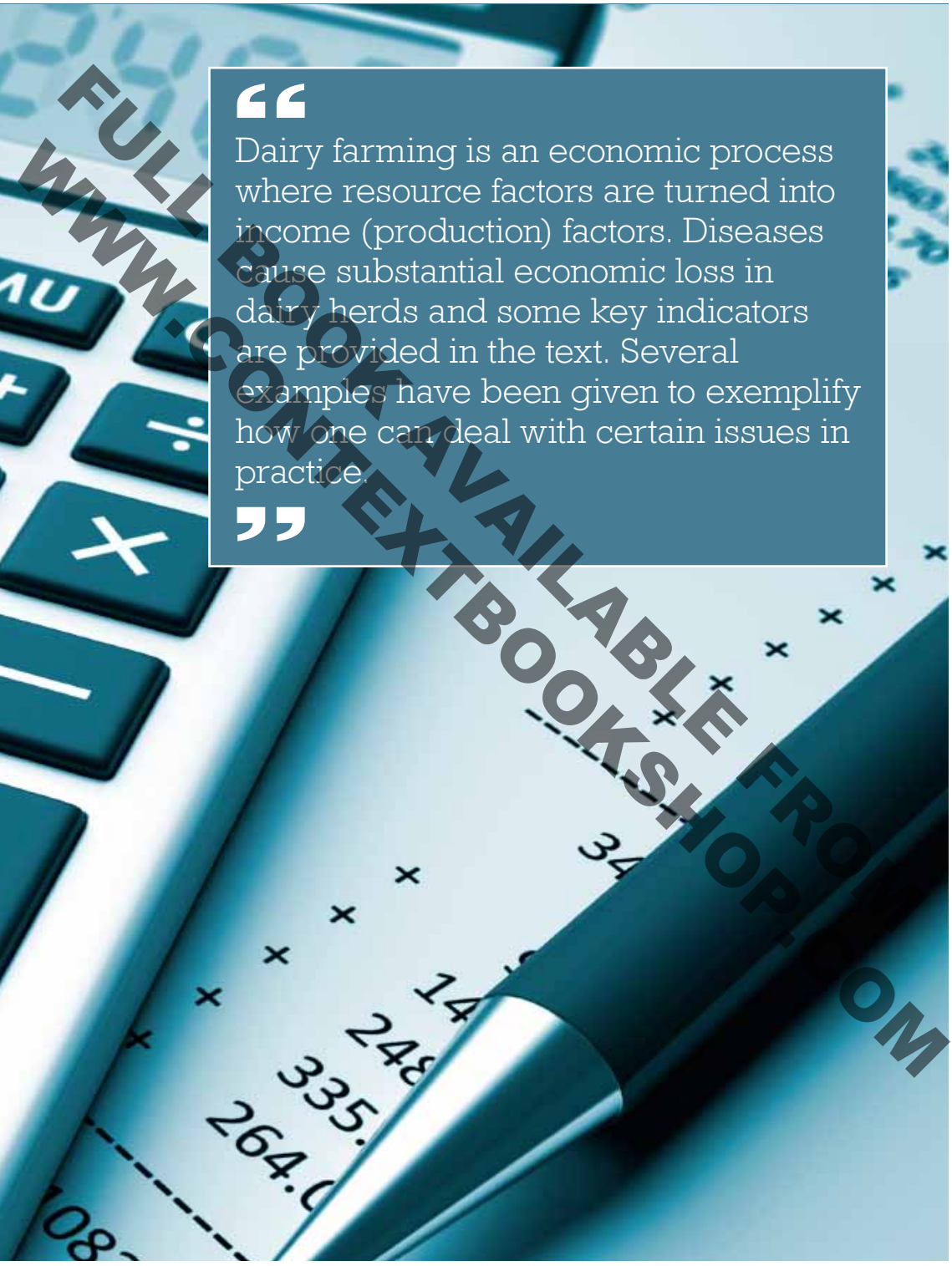
		YES	NO
Feed and feeding	The average BCS of the dry cows is above 3.5		
	Feed intake in dry cows dropped dramatically in late dry period		
Early lactation	Loss of BCS at six weeks after calving is > 1 unit		
	Rumen Fill score after calving is < 3		
Minerals & Vitamins	Dry cows and pregnant heifers receive a standard premix		
		Points scored	
Potential stress factors	Calvings occur in isolation outside the herd (yes = 4 points)		
	At the end of the dry period or on the day of calving, forage quantity differs by more than 50% from that offered in lactation (yes = 2 points)		
	At the end of dry period, the cows are still not adapted to at least two kg of concentrates (yes = 2 points)		
	The calf is not separated from its dam in the first six hrs after birth (yes = 2 points)		
	There are too few cubicles for all cows in the herd (yes = 6 points)		
	There are too few places at the feed rack for all cows to eat (yes = 4 points)		
	There is a lack of cow comfort in the herd (yes = 4 points)		
	Total number of points scored* =		
Herd health	High prevalence of infectious diseases		
	High prevalence of endemic diseases (mastitis, lameness, etc)		

➔ *a total score of points ≥ 6 indicates a lowered disease resistance in the cows.

The general health status of the herd (e.g. IBR, BVD, salmonellosis) may indicate whether such diseases specifically contribute to this lowered disease resistance.

If the answer to several of the above points has been 'YES' then this is indicative of a situation at relatively high risk for poor disease resistance.

In this situation, a more in-depth analysis is warranted to determine the cause(s).



> “Dairy farming is an economic process where resource factors are turned into income (production) factors. Diseases cause substantial economic loss in dairy herds and some key indicators are provided in the text. Several examples have been given to exemplify how one can deal with certain issues in practice.”

Economics - robotic vs. conventional

Source: ABAB, 2008

Table 8.10 The economics of robotic versus conventional farms

Costs (€)	Conventional	Robot farms
Net revenue per 100 kg milk	28,82	27,90
Fertiliser	0,46	0,35
Energy	1,22	1,31
Personnel	0,33	0,24
Depreciation	7,90	9,19
Lease costs / quota	0,51	0,59
Other	7,10	7,75
Financing	4,52	5,11
Totals (including machine costs)	6,78	3,36
Depreciation - machines/installations	1,92	3,45
Maintenance, small materials	1,19	1,52
Other machinery	0,23	0,32
Fuel	0,59	0,58
Calculated interest (machinery)	0,59	1,20
Costs of machines/installations	4,52	7,07

Feed & Feeding Management

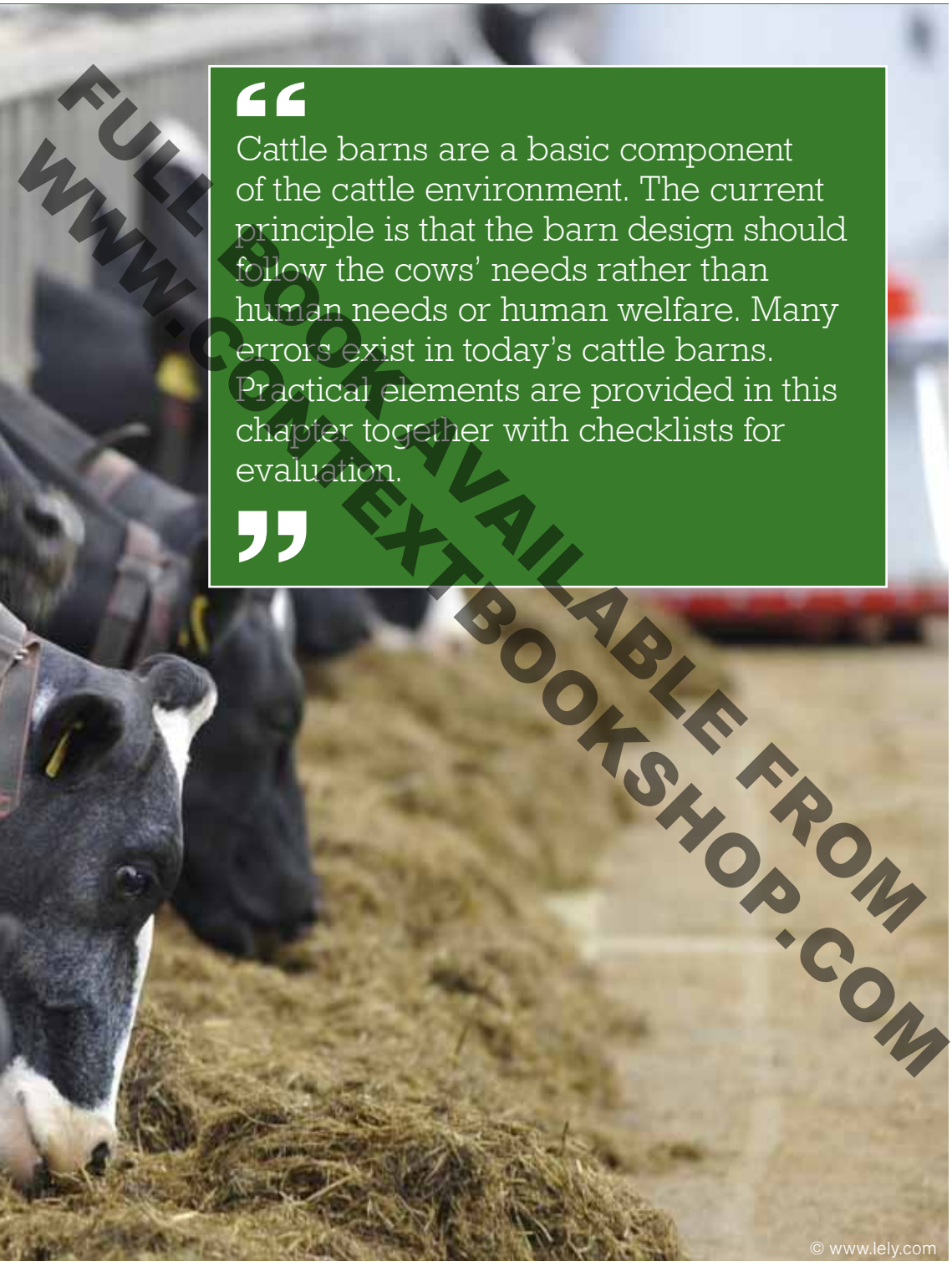
Cattle nutrition is one of the pillars of cattle production. Evaluation sheets and checklists are presented designed to help fine-tune feed and feeding management on the farm. Lists highlighting areas for risk assessment have also been included. Maize silage has received particular attention, not only because it is a good ration component, but also because it has sustainability features. Finally, this chapter contains a simple monitoring tool that includes scoring rumen fill, faecal consistency and undigested faecal fibre, which can be used as part of routine monitoring of rumen function, rumen health and productivity..

Palatability of forage risk factors checklist

Table 9.7 Checklist for risk factors associated with palatability of forage

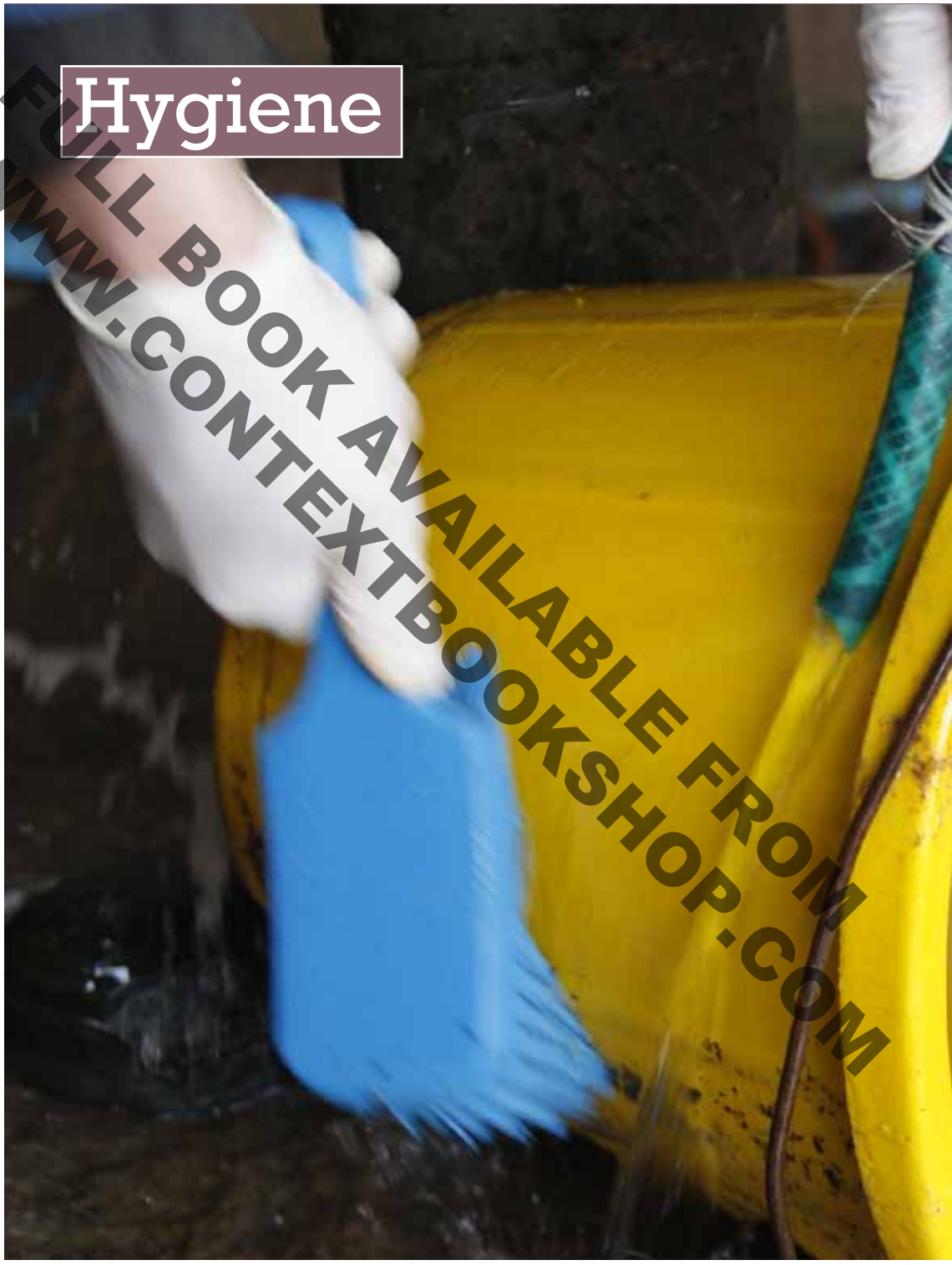
	Risk factors	Score for primary forage source 1 (poor) to 5 (good)	Score for secondary forage source 1 (poor) to 5 (good)
Feed harvesting & stock	Particle length		
	% DM in silage		
	Additives		
	Silage density		
	Height of silage hump		
	Feeding speed of the silage hump per week		
	Silage made in layers		
	Silage made in vertical portions		
	Heating found in silage hump		
	Covering of silage correct		
	Temperature in the silage hump is > or < ambient temperature		
Silage-face cutting method	Remainders		
	Time interval between cutting and feeding		
	Quality losses		
	Feeding speed of the silage hump per week		
	Time taken to mix TMR (norm < 10 min)		

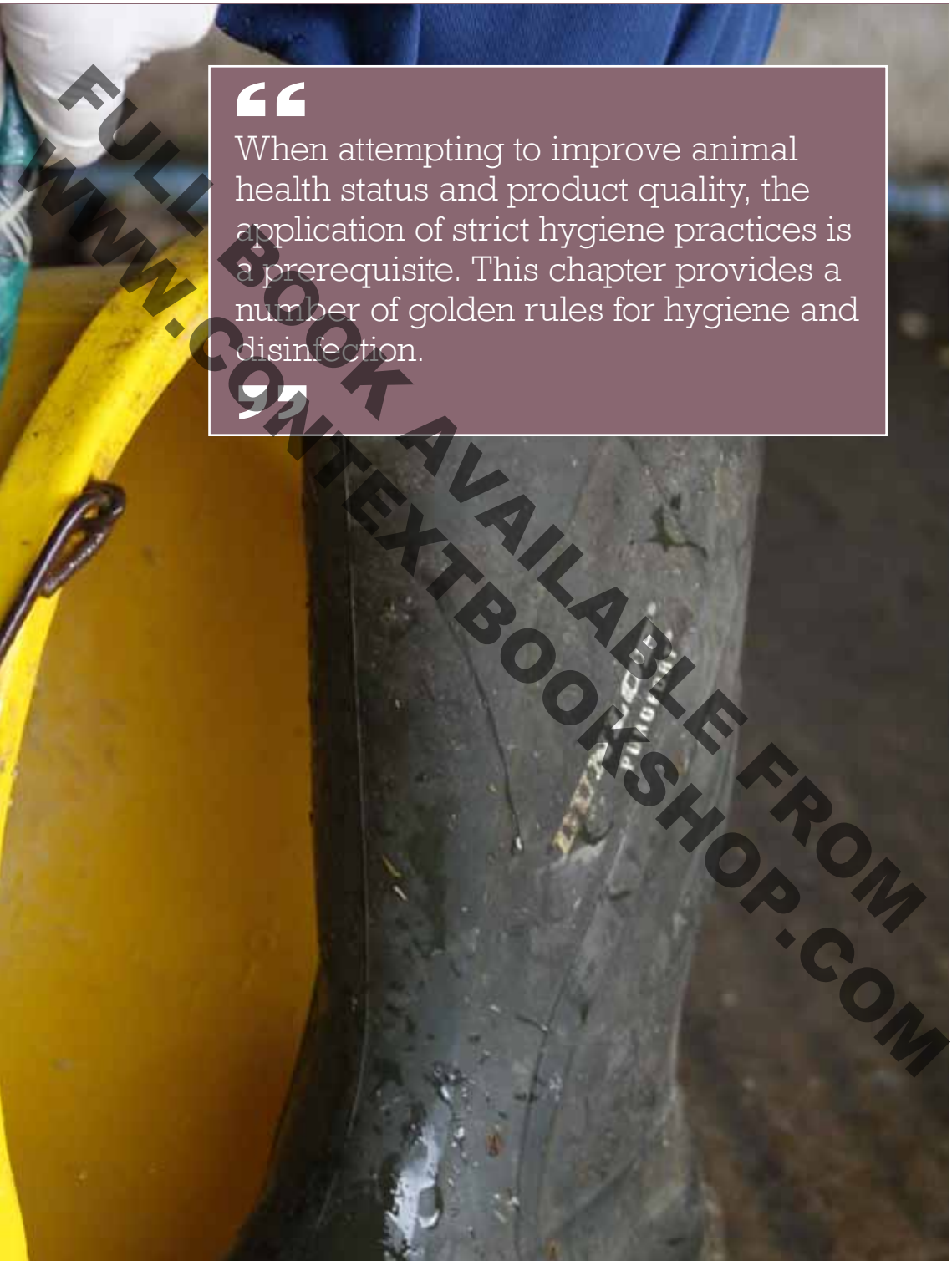
Housing



> “Cattle barns are a basic component of the cattle environment. The current principle is that the barn design should follow the cows’ needs rather than human needs or human welfare. Many errors exist in today’s cattle barns. Practical elements are provided in this chapter together with checklists for evaluation.”

Hygiene





> When attempting to improve animal health status and product quality, the application of strict hygiene practices is a prerequisite. This chapter provides a number of golden rules for hygiene and disinfection.

Hygiene & management in the milking parlour

After S. Klimpel & B. Maassen-Francken, GEA Group, Internatl Dairy Topics vol.10, nr.3

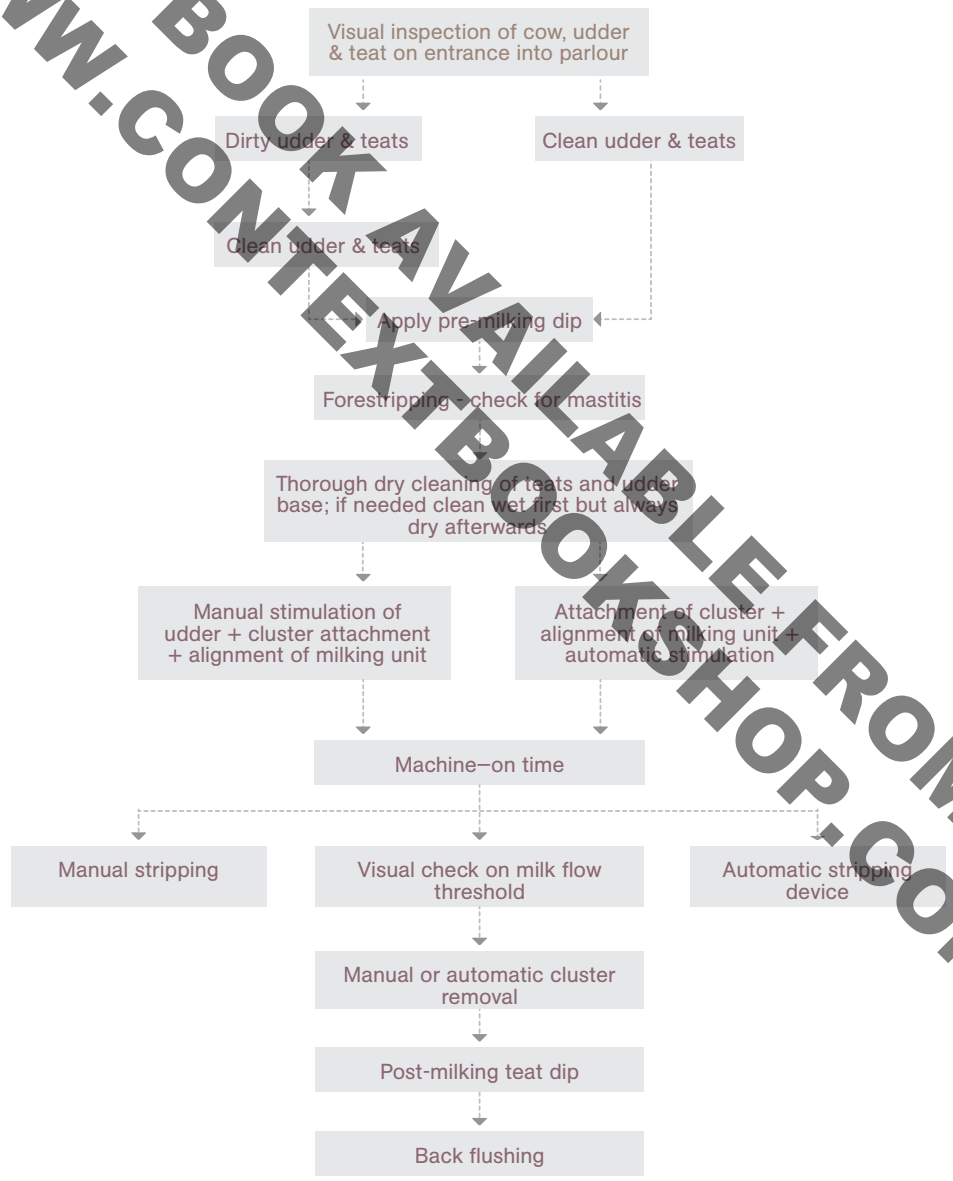
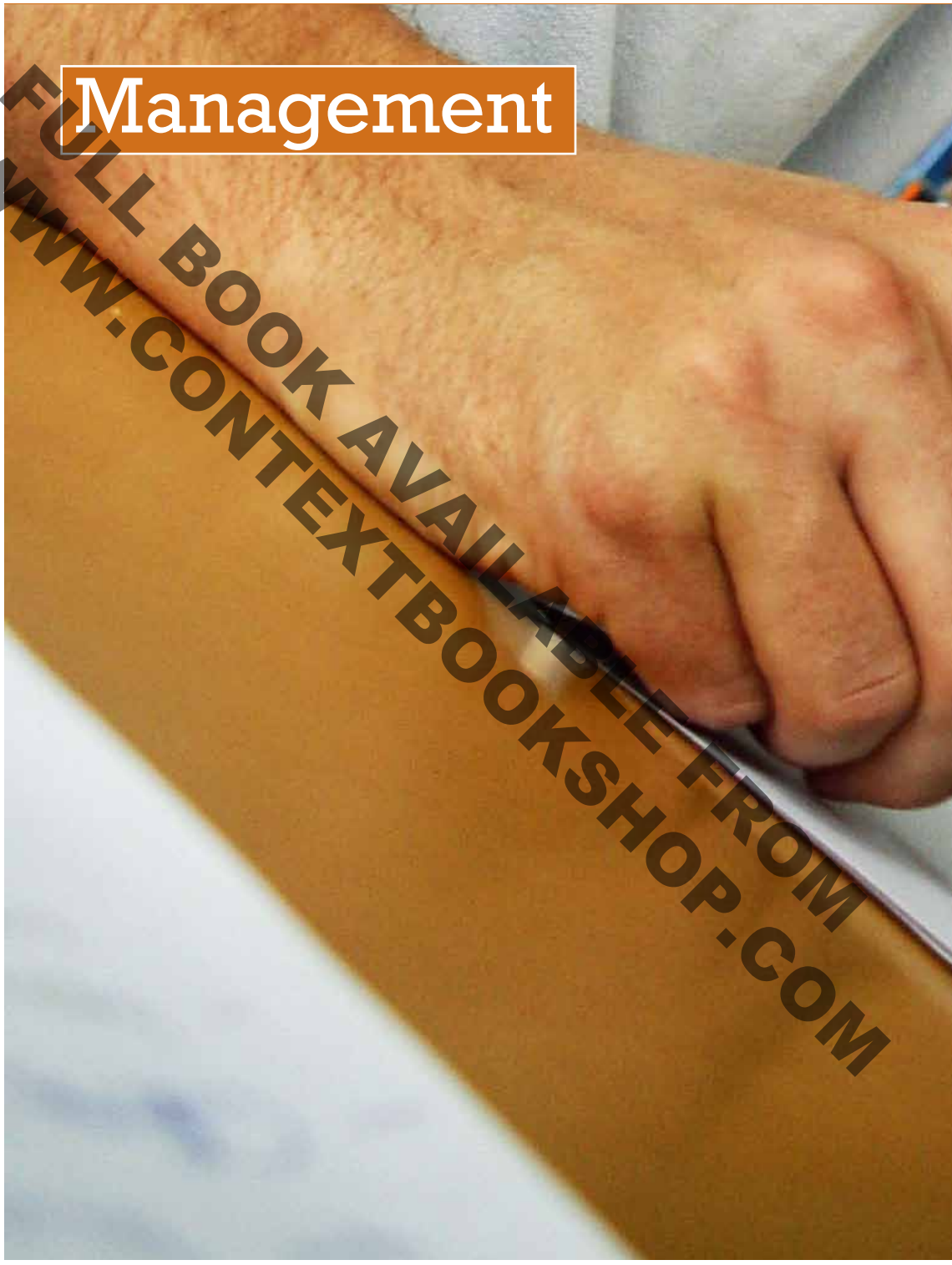
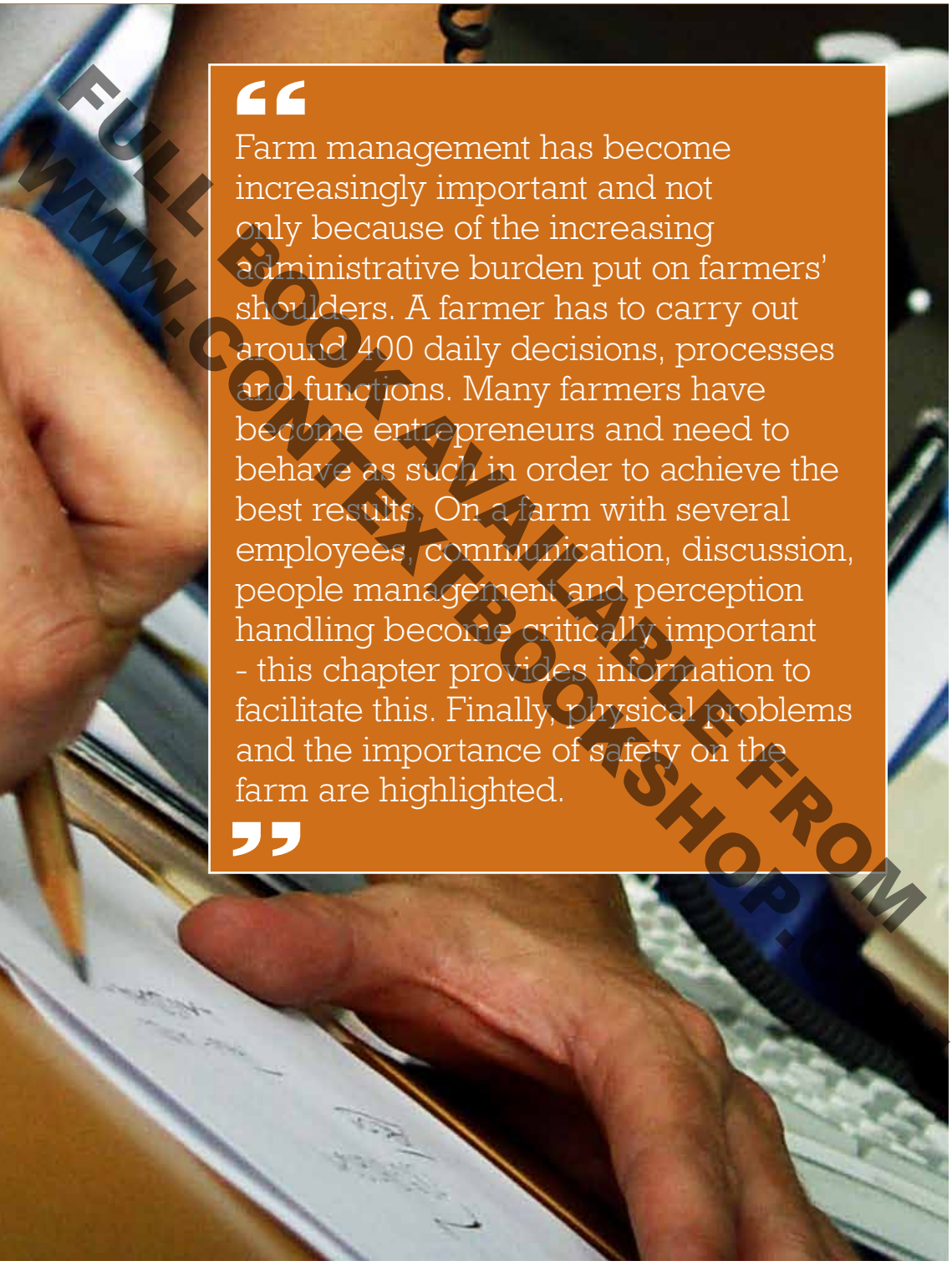
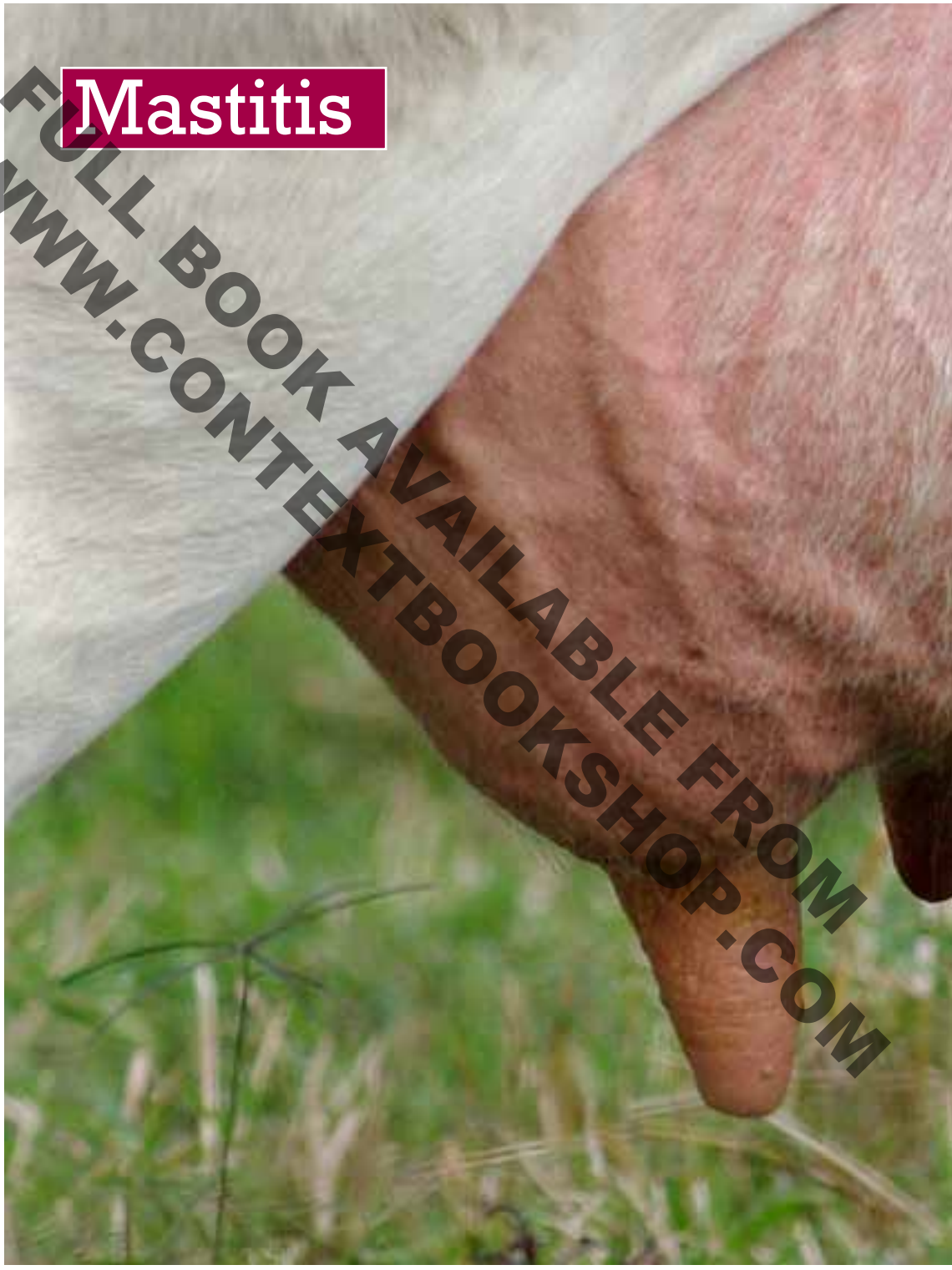


Figure 11.2 Hygiene and management in the milking parlour



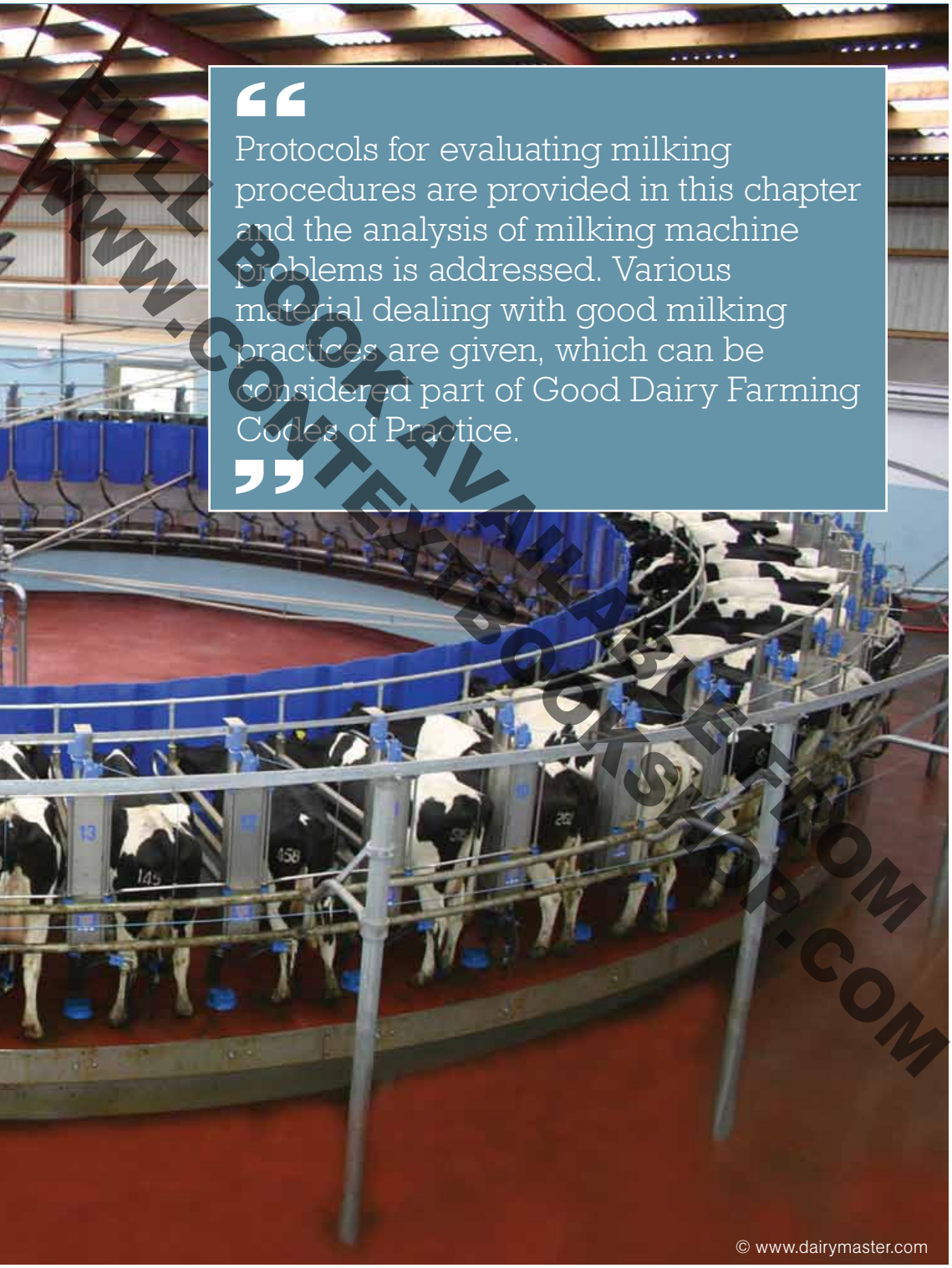


Farm management has become increasingly important and not only because of the increasing administrative burden put on farmers' shoulders. A farmer has to carry out around 400 daily decisions, processes and functions. Many farmers have become entrepreneurs and need to behave as such in order to achieve the best results. On a farm with several employees, communication, discussion, people management and perception handling become critically important - this chapter provides information to facilitate this. Finally, physical problems and the importance of safety on the farm are highlighted.



> This chapter deals with various practical tools for monitoring, diagnosing and treating mastitis cases. Additionally, problem analysis protocols and checklists are presented, as well as checklists for detecting potential errors in the milking machine and among milkers.

Milking practise

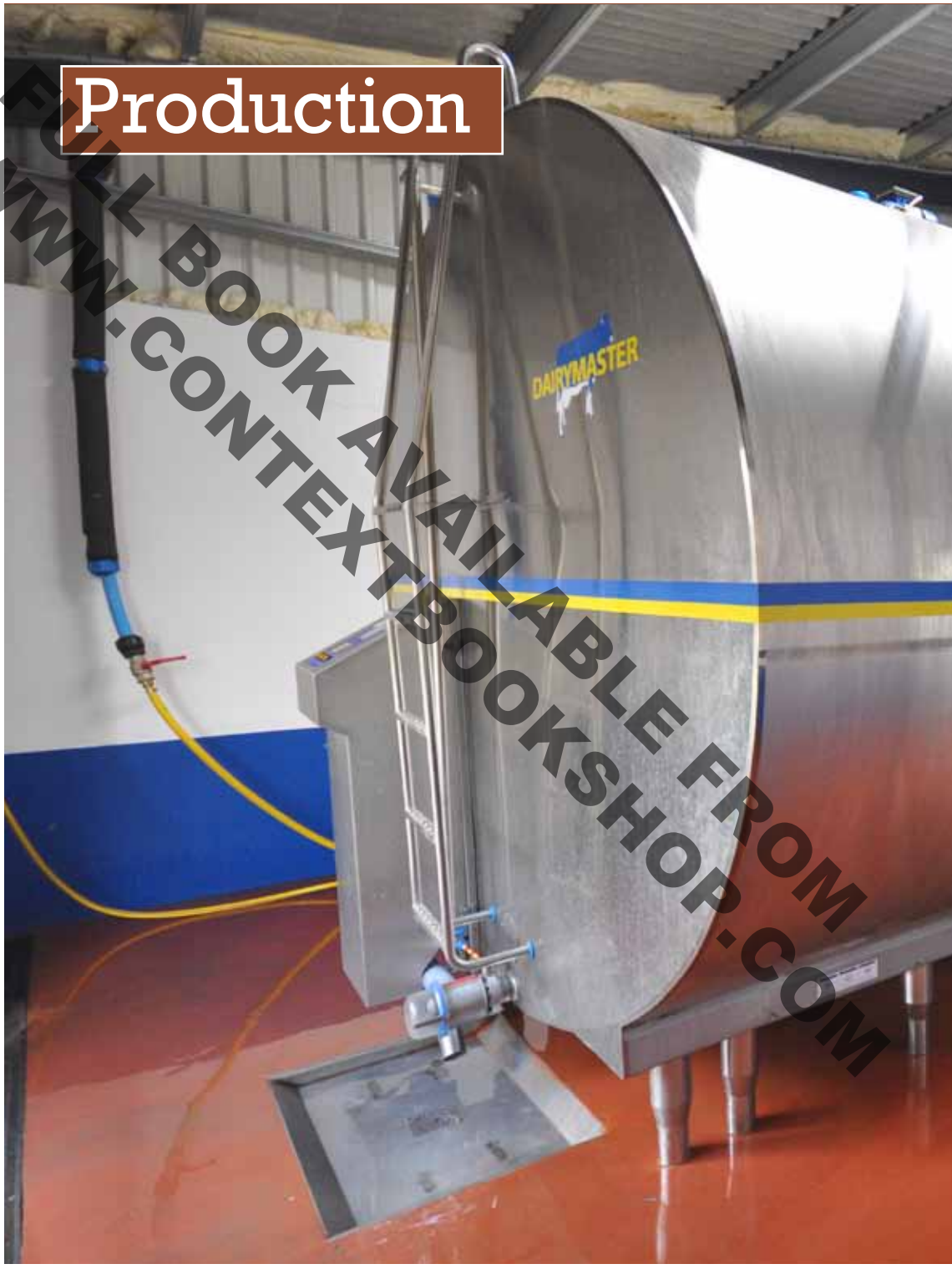


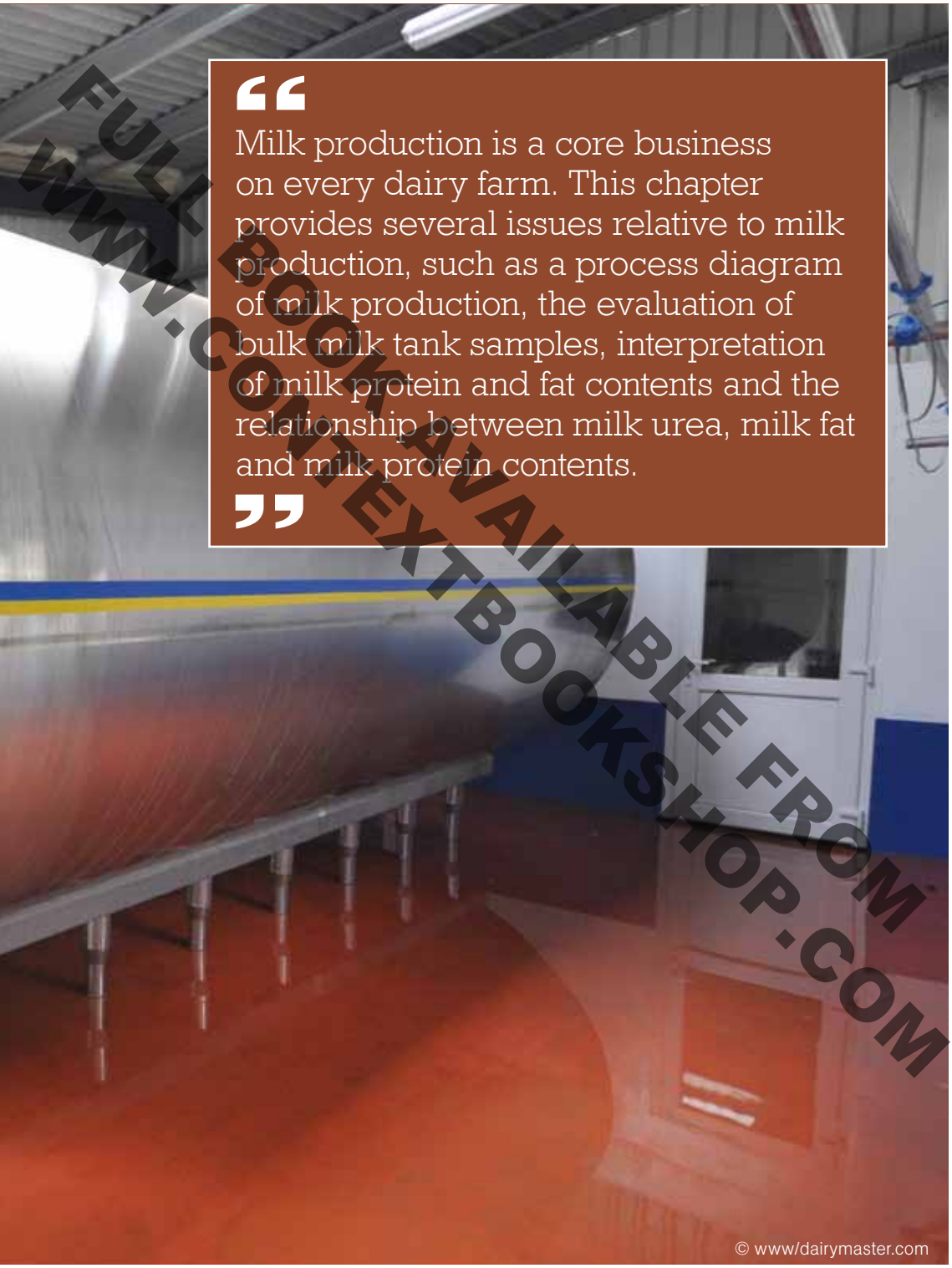
> Protocols for evaluating milking procedures are provided in this chapter and the analysis of milking machine problems is addressed. Various material dealing with good milking practices are given, which can be considered part of Good Dairy Farming Codes of Practice.

Milking machine and/or personnel problems

Problem	Checkpoints for milking machine	Checkpoints for personnel	Other potential causes
Somatic cell count is too high	See known risk factors	Adaptation of milking practice ?	Other known risk factors
Too many bacteria in the milk	Cleaning of the machine after milking is poor. The water temperature is too low at start (<80°C) and/or at end of cycle (<40 °C). Machine parts are worn.	A non-hygienic milking.	Temperature of bulk tank is too high (>4°C). Cleaning of tank is insufficient.
Loss of milk production	Insufficient milking: Vacuum; ratio; pulsation; teat liners.	Poor udder/teat preparation (variable; disturbed routines; too many different people).	Feeding Weather Genetics Housing Climate etc.

Production



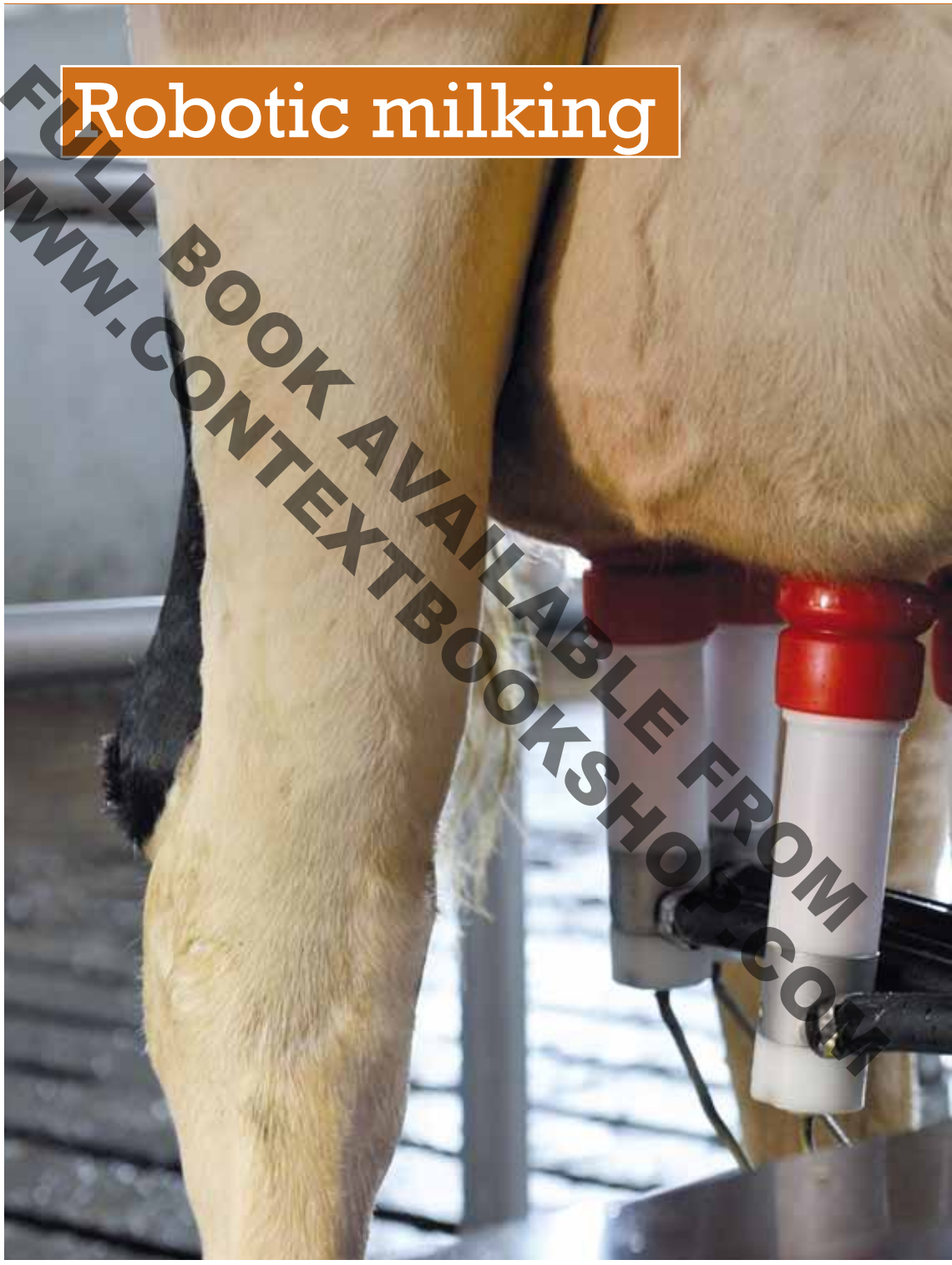


Milk production is a core business on every dairy farm. This chapter provides several issues relative to milk production, such as a process diagram of milk production, the evaluation of bulk milk tank samples, interpretation of milk protein and fat contents and the relationship between milk urea, milk fat and milk protein contents.

Reproduction

> “Reproductive performance has always been a key component of herd fertility schemes and herd health & productivity management. In this chapter, we limit ourselves to the interpretation of herd reproductive data, monthly and yearly performance data. Moreover, a protocol is introduced for analysing reproductive problems in the herd. Finally, some more specific aspects are addressed, such as *Neospora* abortions and the relationship between milking and oestrus/ovulation in dairy cows.”

Robotic milking



> This chapter starts with aspects to consider before installing a milking robot on the farm. Additionally, robot milking and udder health, the use of data from the robot and a protocol for using the robot are also dealt with, together with key success factors for robotic milking.

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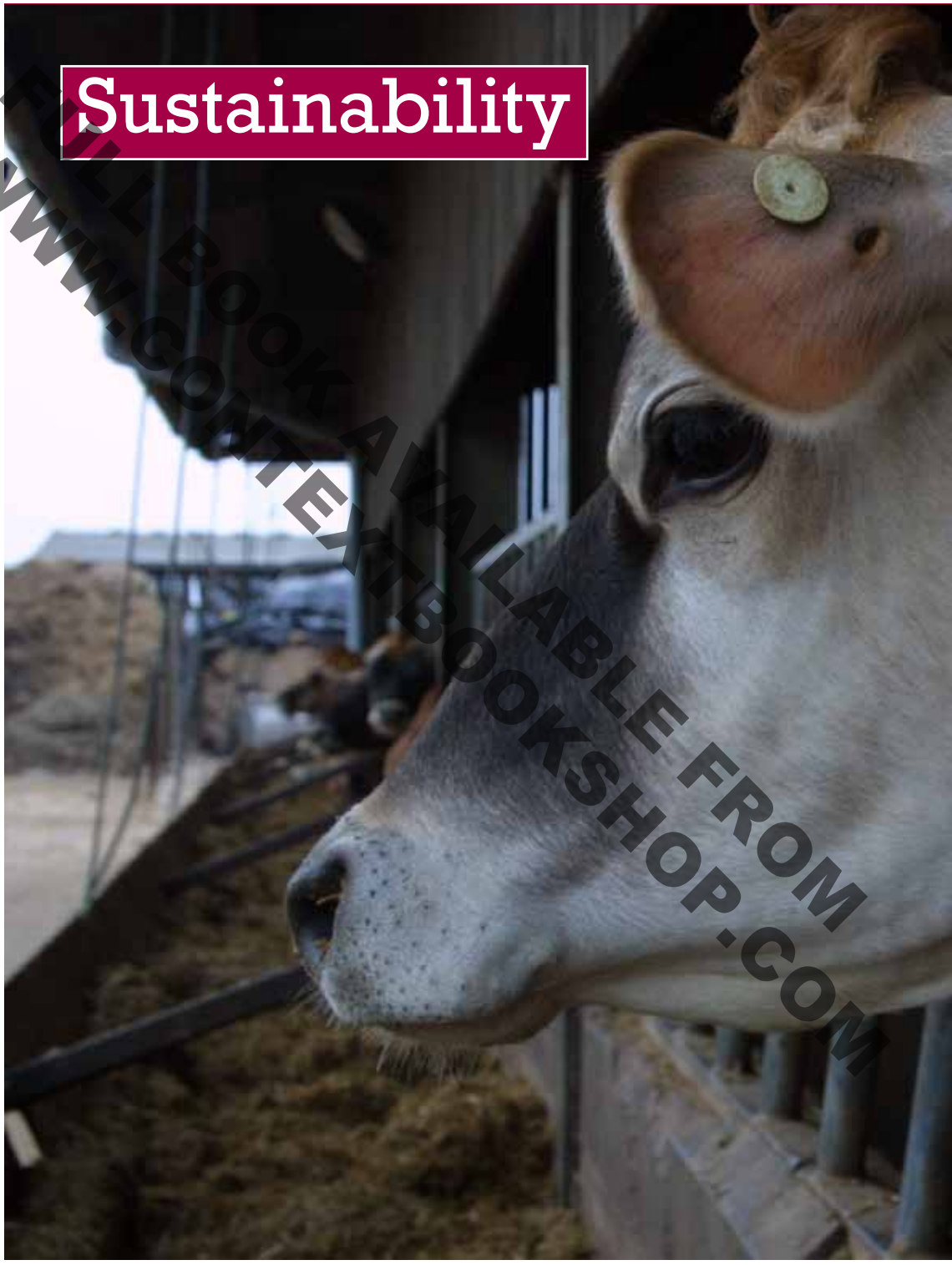
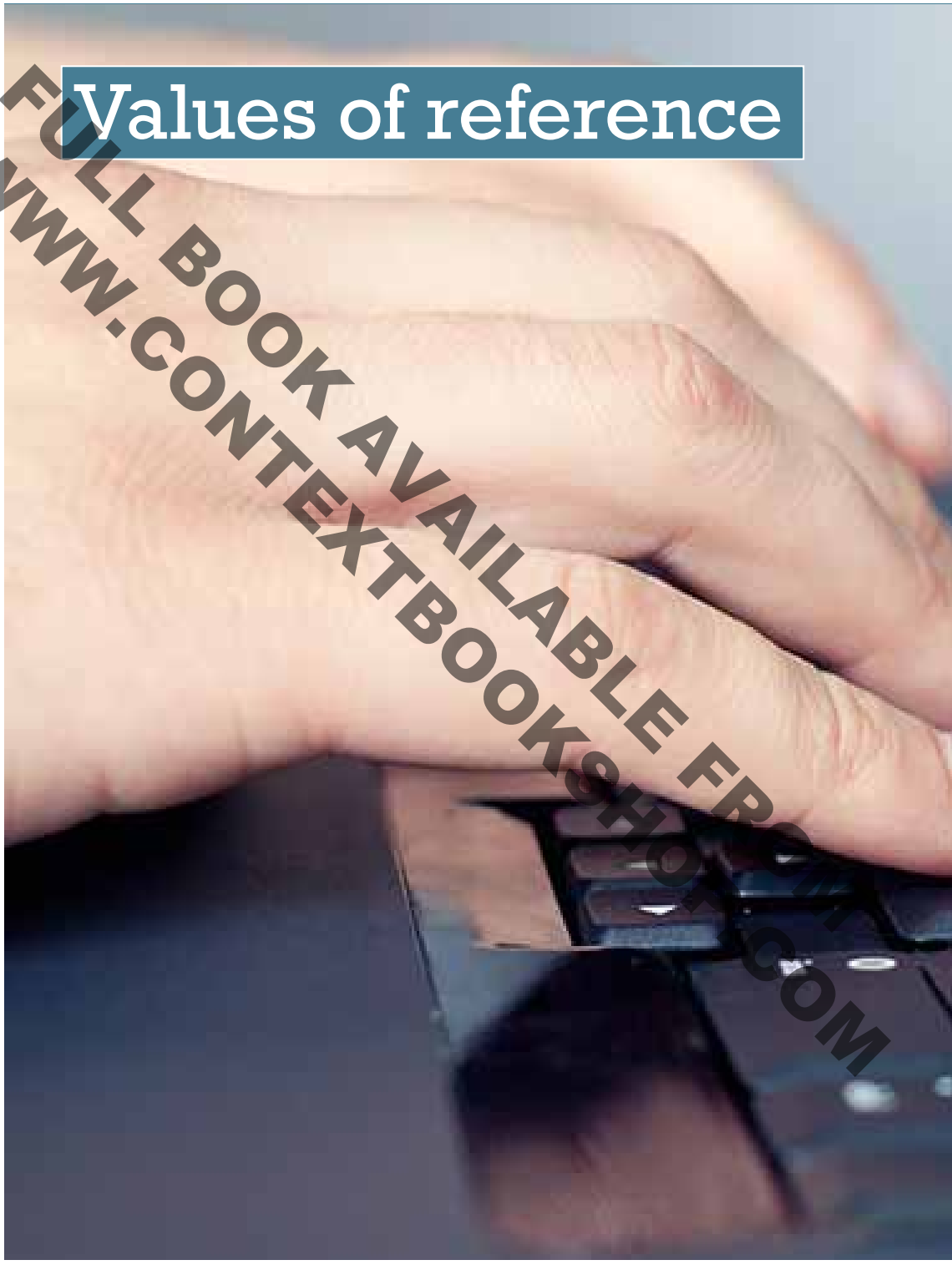
Sustainability



> Sustainability on the dairy farm is a hot topic and is, therefore, included in this book. This chapter presents the four pillars of the sustainability concept and subsequently deals with contributions from the food chain to climatic change. Finally, several approaches to improve sustainability on the dairy farms are presented.

Values of reference



> Dairy farming is a process based on economics and performance parameters used to evaluate this process. To address performance over time, the (monthly or yearly) performance parameters are compared with target or reference values. Such target values are primarily farm-based. Performance parameters can also be compared with those of other, similar farms, or whole regions. In this chapter, various reference value, are presented, as an example, to facilitate comparisons. Farmers should always set target values for performance on their own farm.

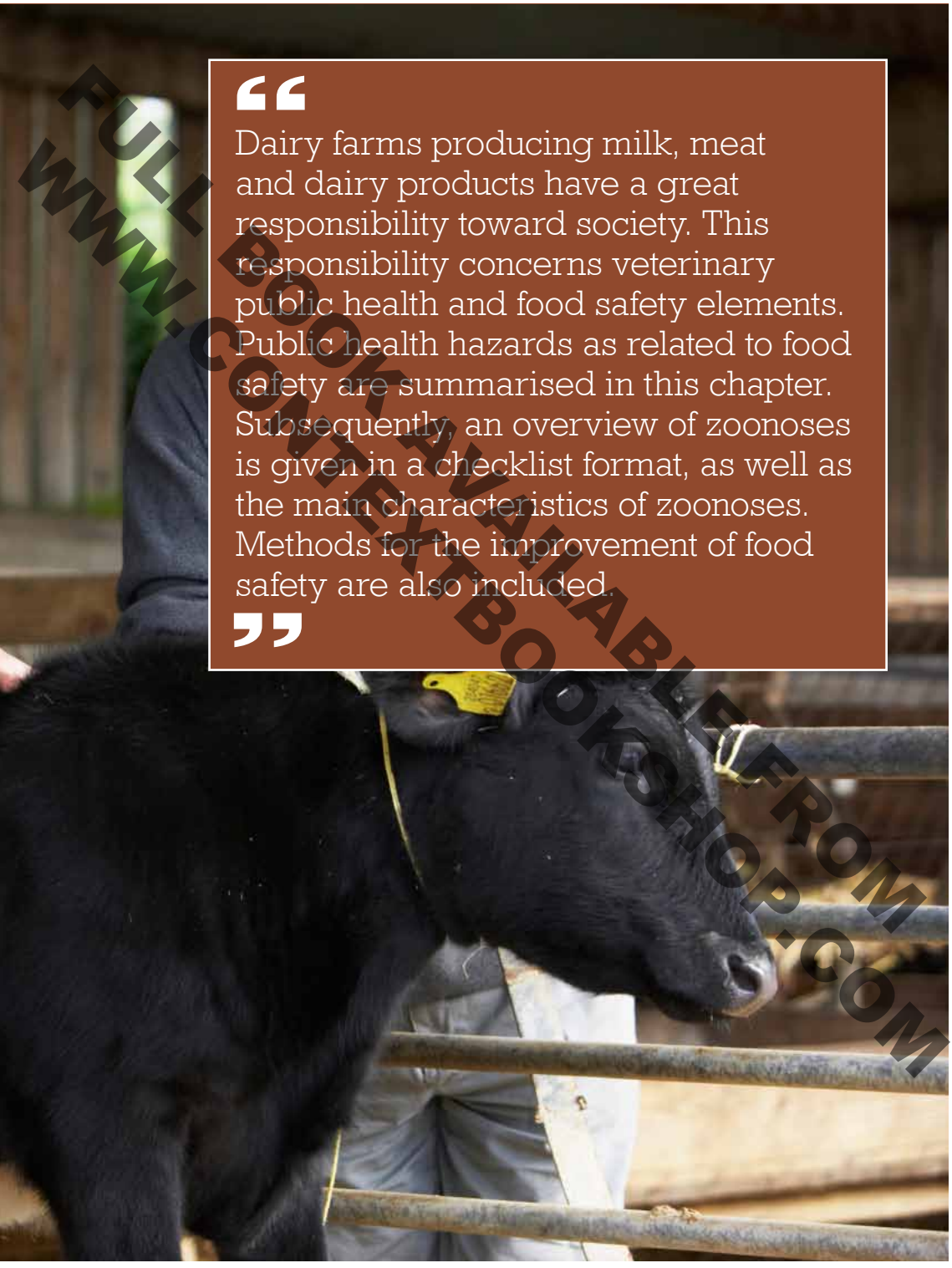
Dairy production parameters

Table 20.1 Reference value for cows for important dairy production parameters- diagnostic evaluation

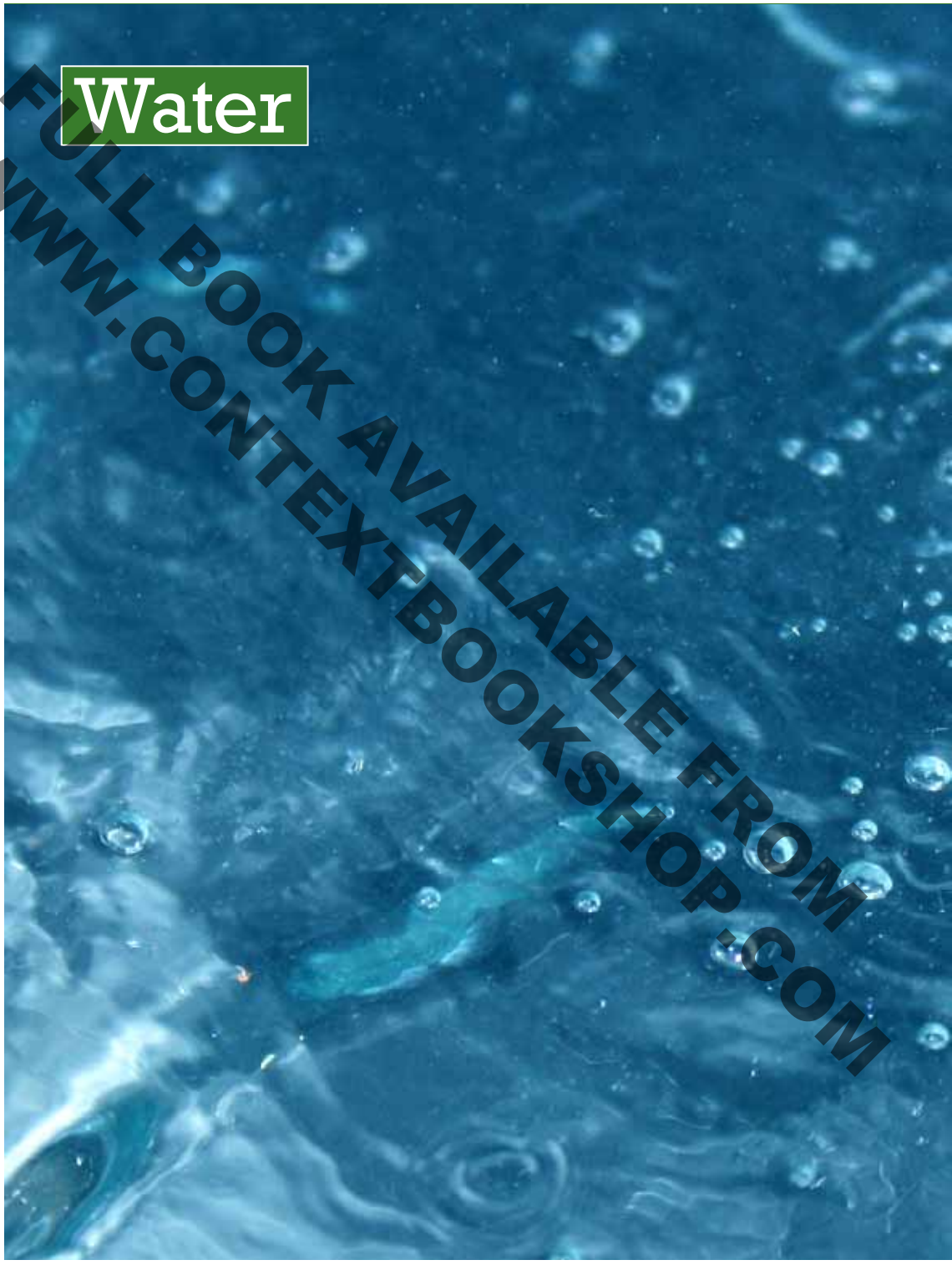
	At calving	Early lactation	Mid lactation	End lactation	At dry off
Body condition score (1-5)	3 ½ → 3	2 ½ → 3	3	3 → 3 ½	3 ½ → 4
Rumen Fill score (1-5)	3	3	3 ½	4	4 – 4 ½
Faecal consistency score (1-5)	2 - 3	2 - 3	3	3 - 4	4
Fibres in faeces score	1 - 2	1 - 2	1 - 2	1 - 2	1 - 2
Locomotion score (1-5)	Herd distribution →	> 85% at score 1 or 2	< 10% at score 3	< 3% at score 4	< 2% at score 5
Hock lesions*	< 15%				
Poor leg posture* (% of cows in herd)	< 15%				
Hygiene & cleanliness	Herd distribution →	> 85% of the cows at score 1 or 2	< 15% dirty cows (score 3 or 4)		< 5% dirty dry cows (score 3 or 4)
Ketosis *	Herd level	< 5 %			
Acidosis *	Herd level	< 2 %			
Digestive problems *	Herd level	< 5 %			
Frequency of cows ruminating in the herd	Herd level	> 85%			

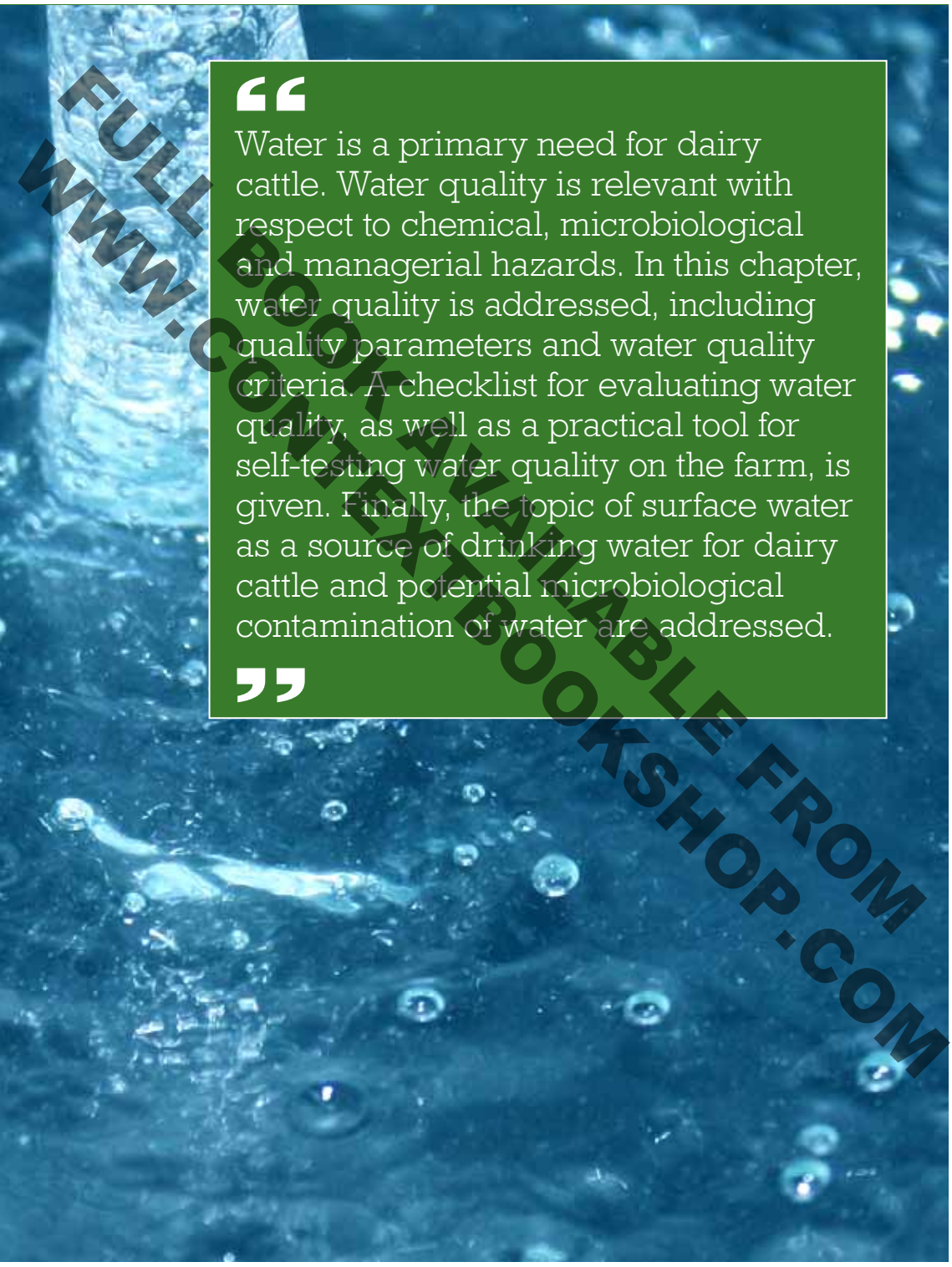
* Reference & target values are dynamic and can vary according to production, breed, husbandry method etc.

Veterinary public health



> Dairy farms producing milk, meat and dairy products have a great responsibility toward society. This responsibility concerns veterinary public health and food safety elements. Public health hazards as related to food safety are summarised in this chapter. Subsequently, an overview of zoonoses is given in a checklist format, as well as the main characteristics of zoonoses. Methods for the improvement of food safety are also included.





Water is a primary need for dairy cattle. Water quality is relevant with respect to chemical, microbiological and managerial hazards. In this chapter, water quality is addressed, including quality parameters and water quality criteria. A checklist for evaluating water quality, as well as a practical tool for self-testing water quality on the farm, is given. Finally, the topic of surface water as a source of drinking water for dairy cattle and potential microbiological contamination of water are addressed.

Self-testing water quality

E.van Eenige, GHM Counotte, JPTM Noordhuizen

Self-testing water quality: Colour, transparency and sediment

Colour good
Transparency good

Colour poor
Transparency good

Colour poor
Transparency good

Colour bad
Transparency bad poor

Colour good
Transparency good
Sediment poor

Colour good
Transparency good
Sediment poor

Drinking water

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